



National Renewable Energy Laboratory
Innovation for Our Energy Future

NREL's Renewable Energy Finance Tracking Initiative (REFTI)



.Q4 2010 Summary

Michael Mendelsohn
Senior Financial Analyst

May 18, 2011

Housekeeping

- Webinar: Got audio?
 - Call-in number: **800-857-9878**
 - participant access code: **2744909**
- Presentation, webinar recording, and aggregated spreadsheet data will be made available at NREL's new RE Finance website:

<http://financere.nrel.gov/>

Agenda

- Intro to REFTI Program
 - Background/Vision
- Q4 2010 Questionnaire Results
 - Will generally follow REFTI questionnaire progression
 - Technology Breakout
 - Aggregate results from Q4 '09 – Q4 '10
 - Trend analysis across multiple quarters
- Question & Answer
 - Submit via internet conference and we will respond at the end

Data Confidentiality

- Ensuring REFTI data confidentiality critical to NREL
- Data gathered through REFTI will only be utilized for:
 - *Providing aggregate values for model inputs*
 - *Reporting trends*
 - *Participant-specific data will not be utilized or distributed in any way*
- Non-disclosure agreements are available
 - *Executing an NDA is fully voluntary*
 - *3 – 12 month NDAs are available*
- Please let us know if you have any concerns over data provided through this webinar
 - *Slides will not be made available immediately to allow time to raise concerns*

Caveats

- This is a summary of data as reported by REFTI participants
- In general, data provided was not validated by NREL
- Potential concerns:
 - Duplicate data
 - Definition of “financial closure”
 - Small sample size

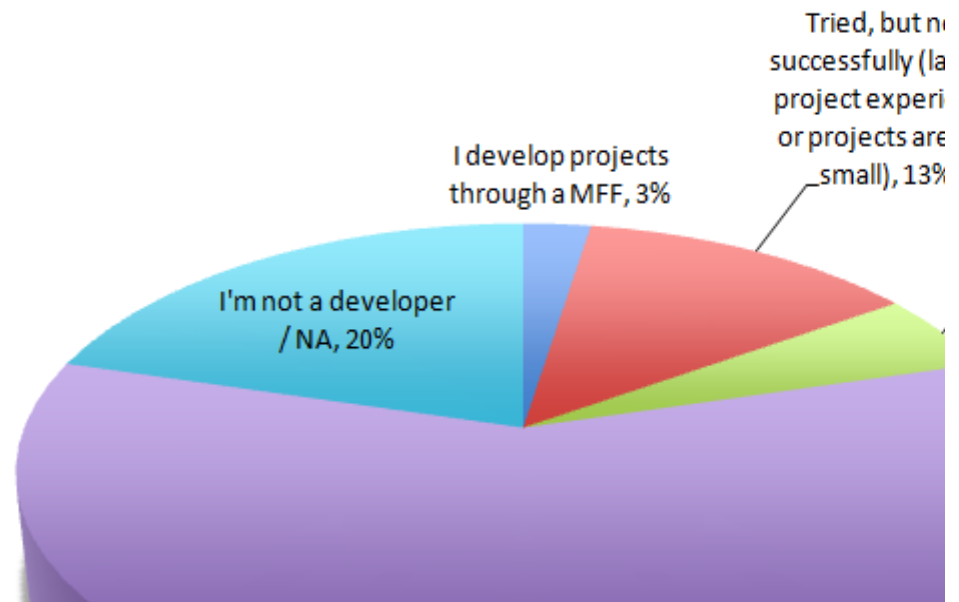
Revised Spreadsheet Format

Poll Question: What is your experience with Master Finance Facilities (MFFs)?

MFFs Experience		
Answer Options	Response %	Response Count
I develop projects through a MFF	3%	1
Tried, but not successfully (lack of project experience or projects are too small)	13%	5
Tried, but not successfully (my technology is considered too risky)	5%	2
Never heard of them	59%	23
I'm not a developer / NA	21%	8
Comments		3
	100%	39

Poll Question: MFFs Experience

What is your experience with Master Finance Facilities (MFFs)?



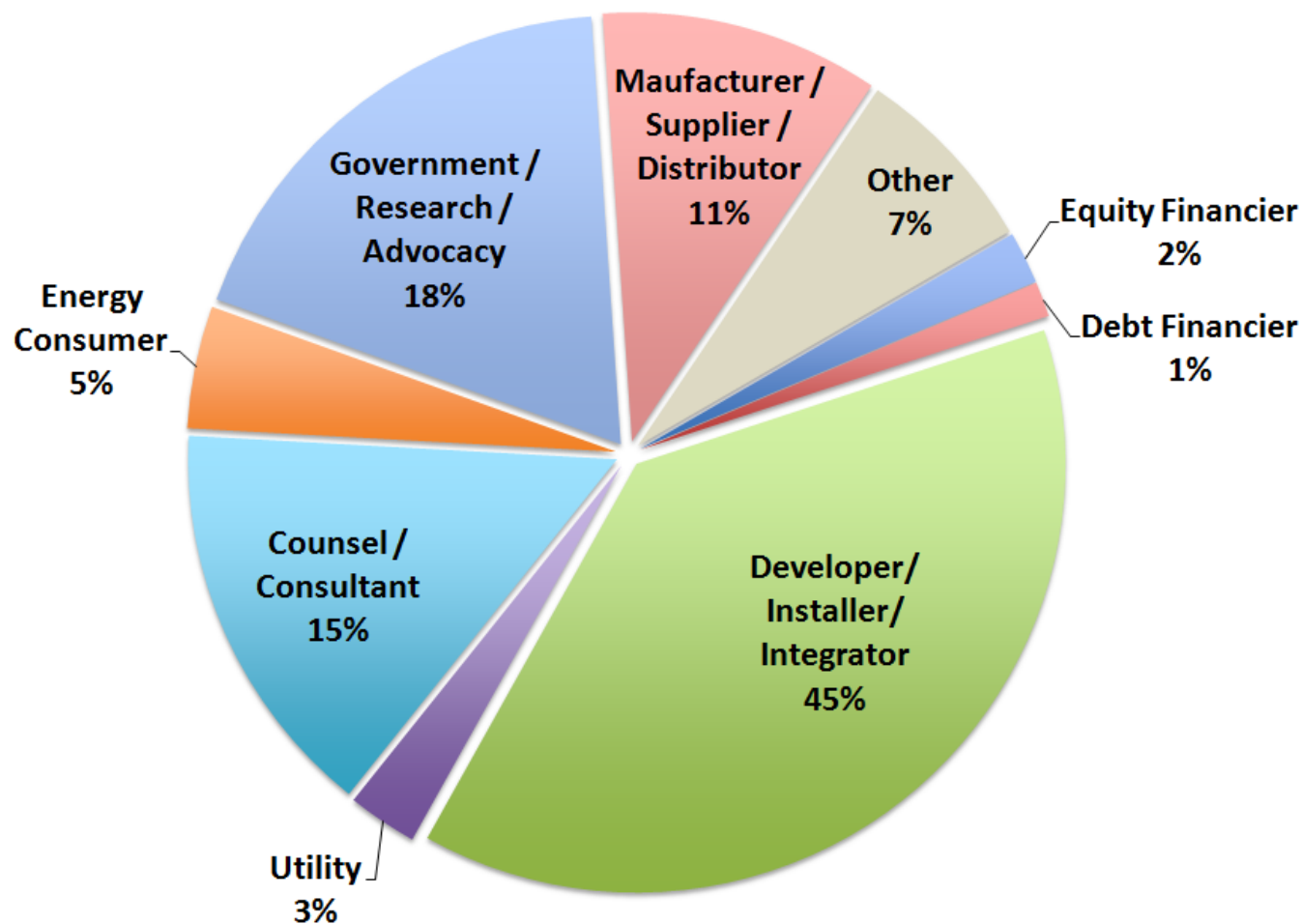
Potential Revised REFTI process

- Semi-annual process (away from quarterly)
- Much shorter questionnaire
 - De-emphasizing behind the meter projects, construction finance, loan guarantees
- Altered question ordering:
 - *Primary questions up front*
 - *More required answers*
- NREL seeking feedback:
 - *How do you use dataset?*
 - *Would semi-annual process improve chance of participation?*
 - *Do you trust NREL to hold data confidentially?*
 - *If you'd like to be part of beta test, let us know*

Table of Contents

- REFTI participants & their project portfolios & investments
- Behind the meter projects – end-user & economic return
- Financial structure and form of incentive and depreciation taken
- REC and PPA contract terms
- Tax and Developer Equity ratios and exp. returns
- Term debt
- Installed and levelized costs
- Bonus questions

Participation: Q4'10 Firm Composition



152 people entered the questionnaire; 119 left contact info.
Developer / Installer / Integrator represented largest segment
with 45%

REFTI Questionnaire: Q3 (p. 2 – project info)

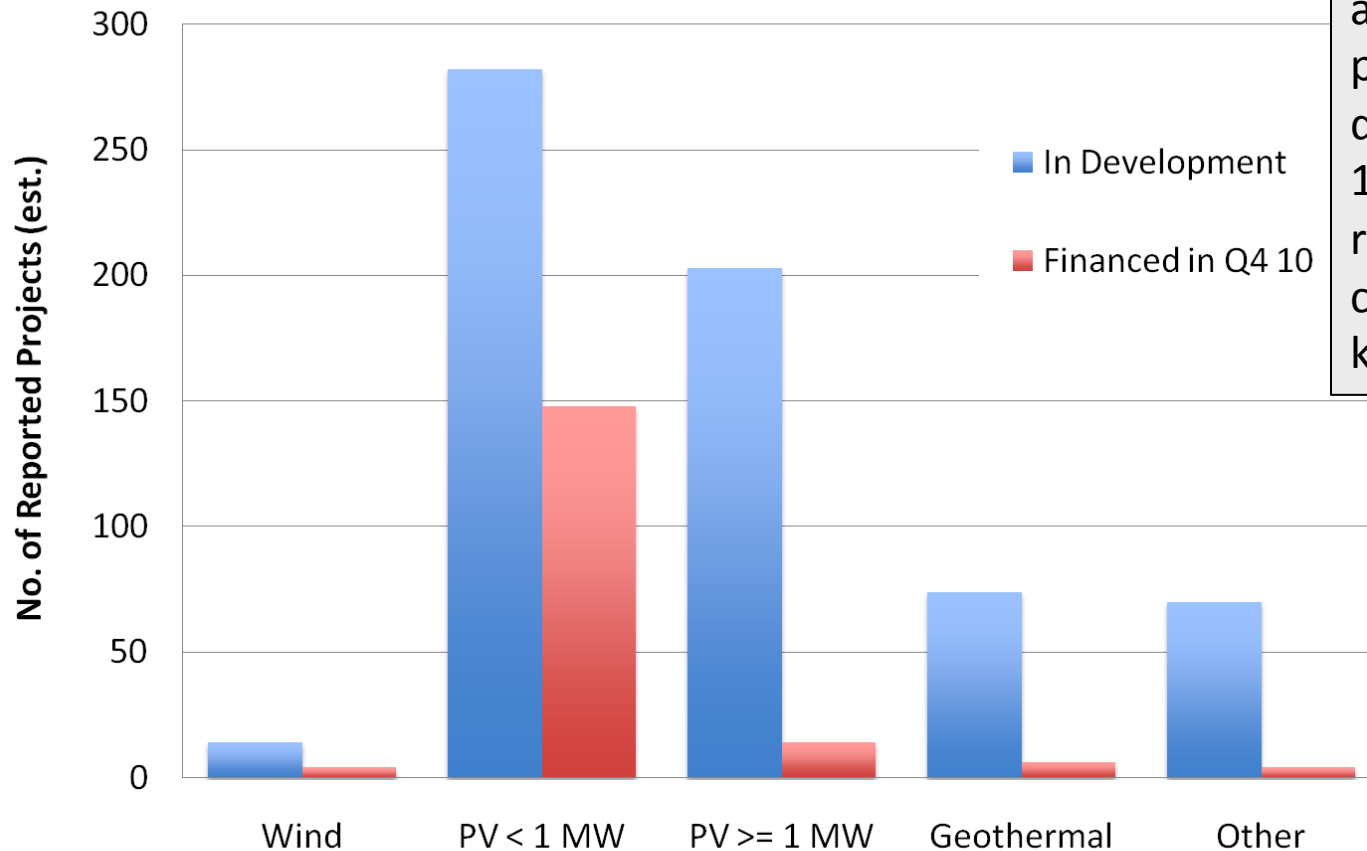
3. Please tell us about your projects IN DEVELOPMENT and those that CLOSED FINANCING in Q4 2010...

*** Note: new MW bins ***

	No. of Projects in Development	Aggregate Capacity in Development (gross kW / MW)	No. of Projects Financially Closed (Q3)	Aggregate Capacity Financially Closed (gross kW / MW)	Form of Financial Closure
Wind	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - PV (< 1 MW)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - PV (>= 1 MW)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - CSP	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar Thermal (non-elec)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Geothermal	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Biomass - Elec	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Biomass - Non-elec	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Hydro	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Other Technologies	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

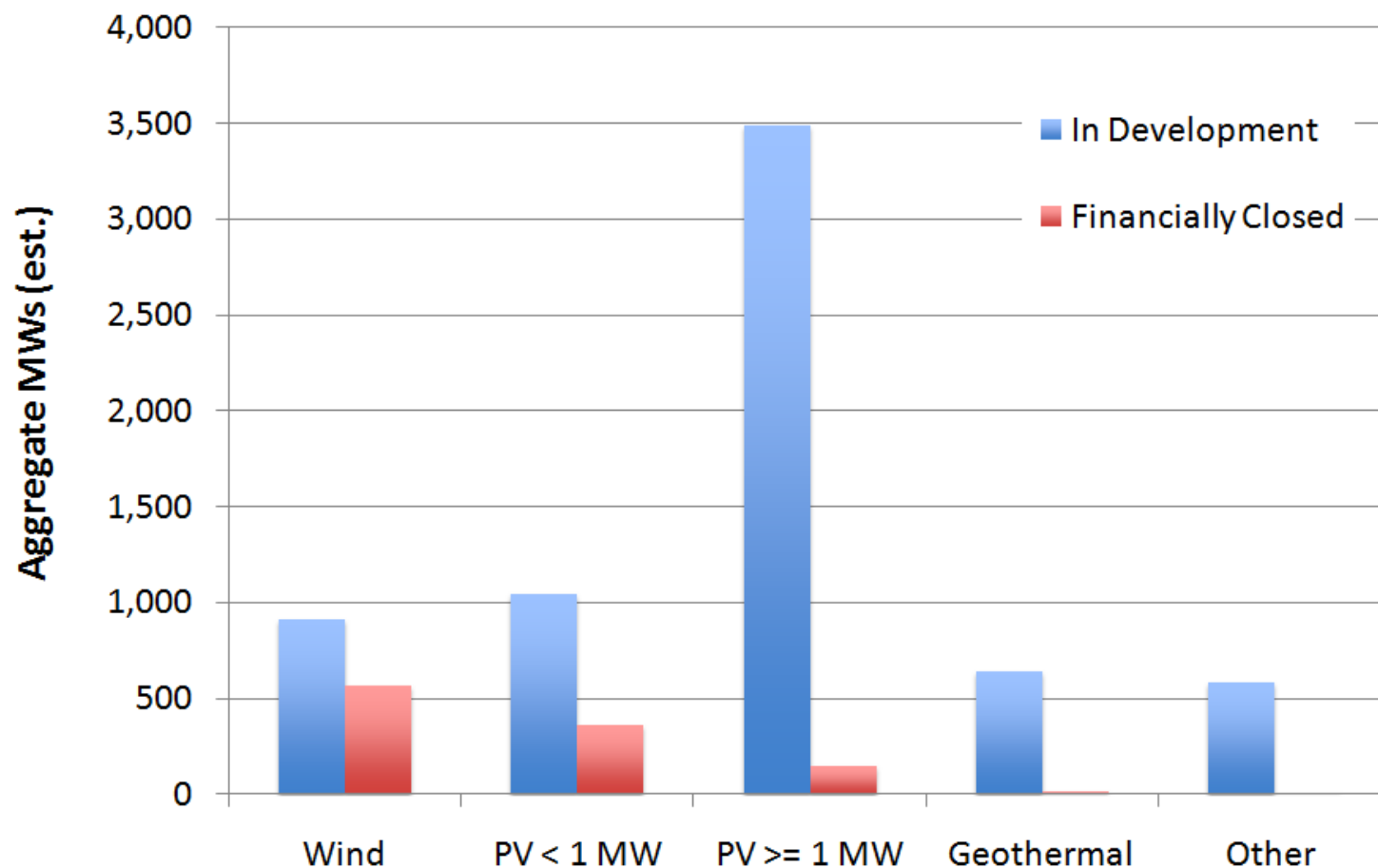
Comments

Number of RE Projects Reported



80 respondents reported approximately 643 projects in development, with 176 projects having reached financial closure of some kind

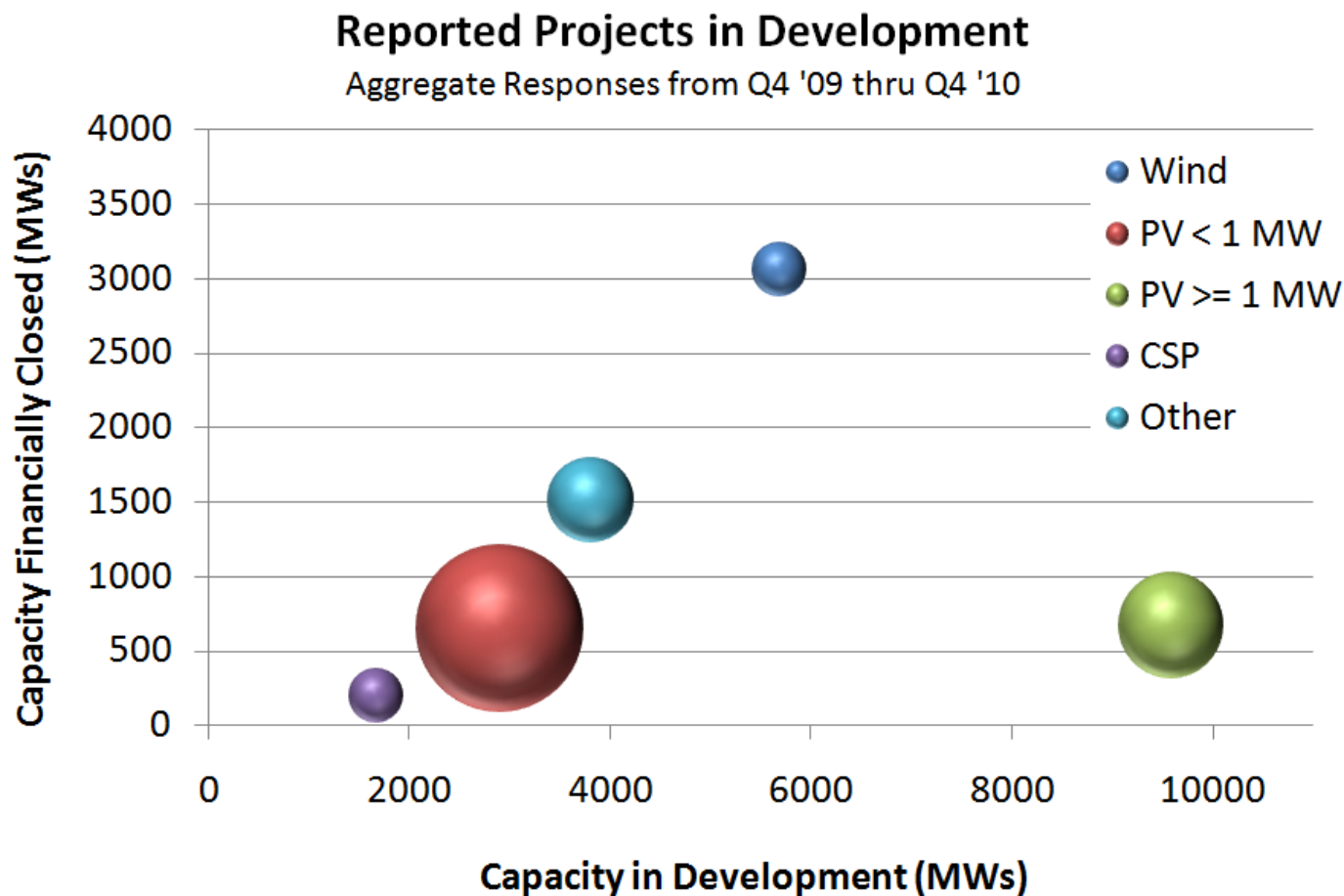
Capacity of Projects Reported (MWs)



Roughly 6,670 MW in development by REFTI participants with 1,090 MW reaching financial closure of some kind.

**** Values estimated based on mid-point of questionnaire bins**

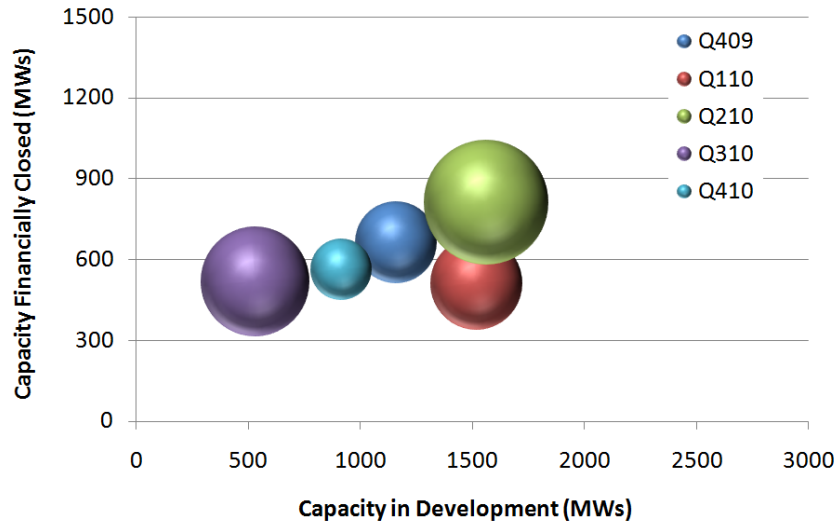
Projects Development Reported via REFTI



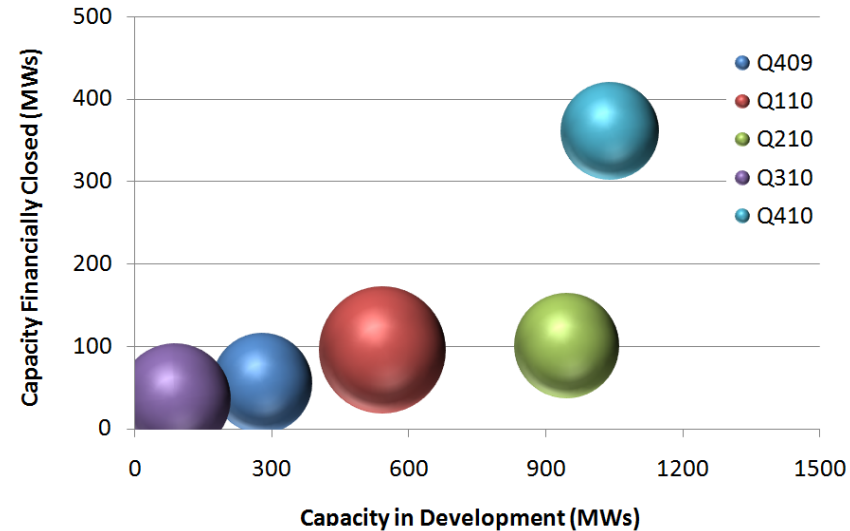
During last 5 quarters of REFTI, participants reported 6,000 MW of wind in development and 3,000 MW closed financially. Large PV had close to 10,000 MW in development, but only 750 MW closed financially

Projects in Development - Trend

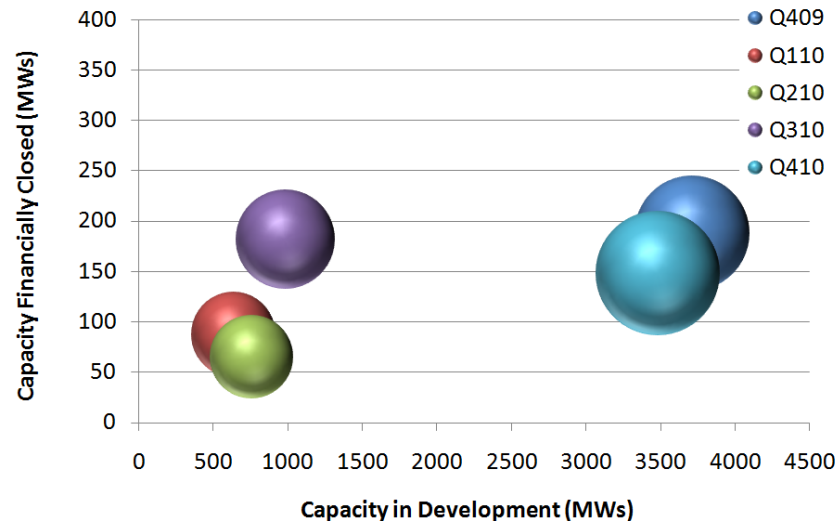
Wind



PV < 1MW

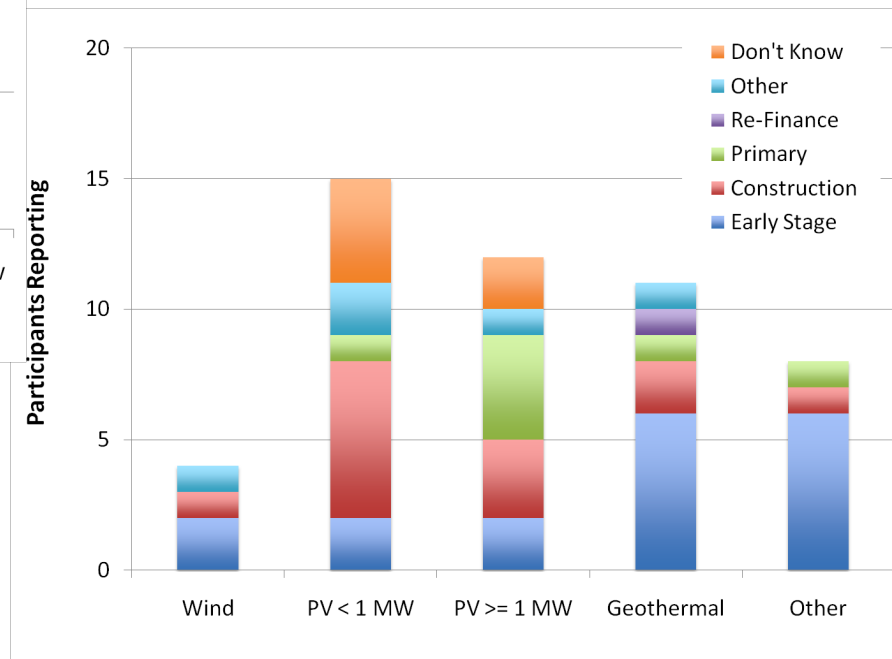
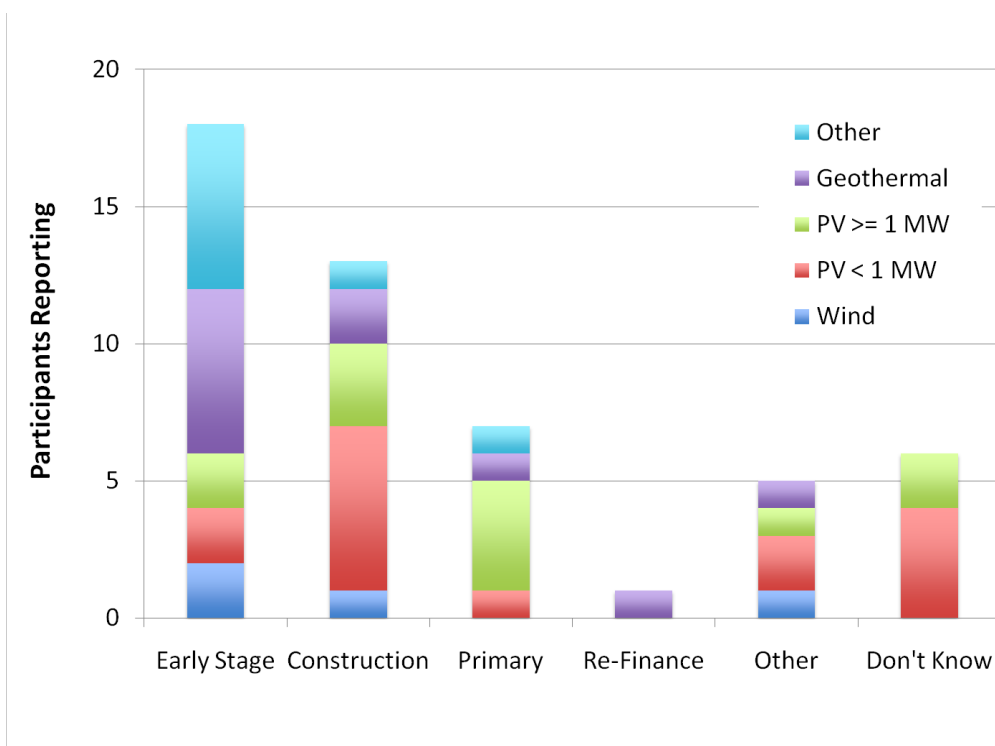


PV >= 1MW



Good representation for PV in Q4 '10. Geothermal, other technologies also improving representation although still very small

Form of Financial Closure



50 respondents indicated form of financial closure. Early stage and construction financing widely reported

REFTI Questionnaire: Q4

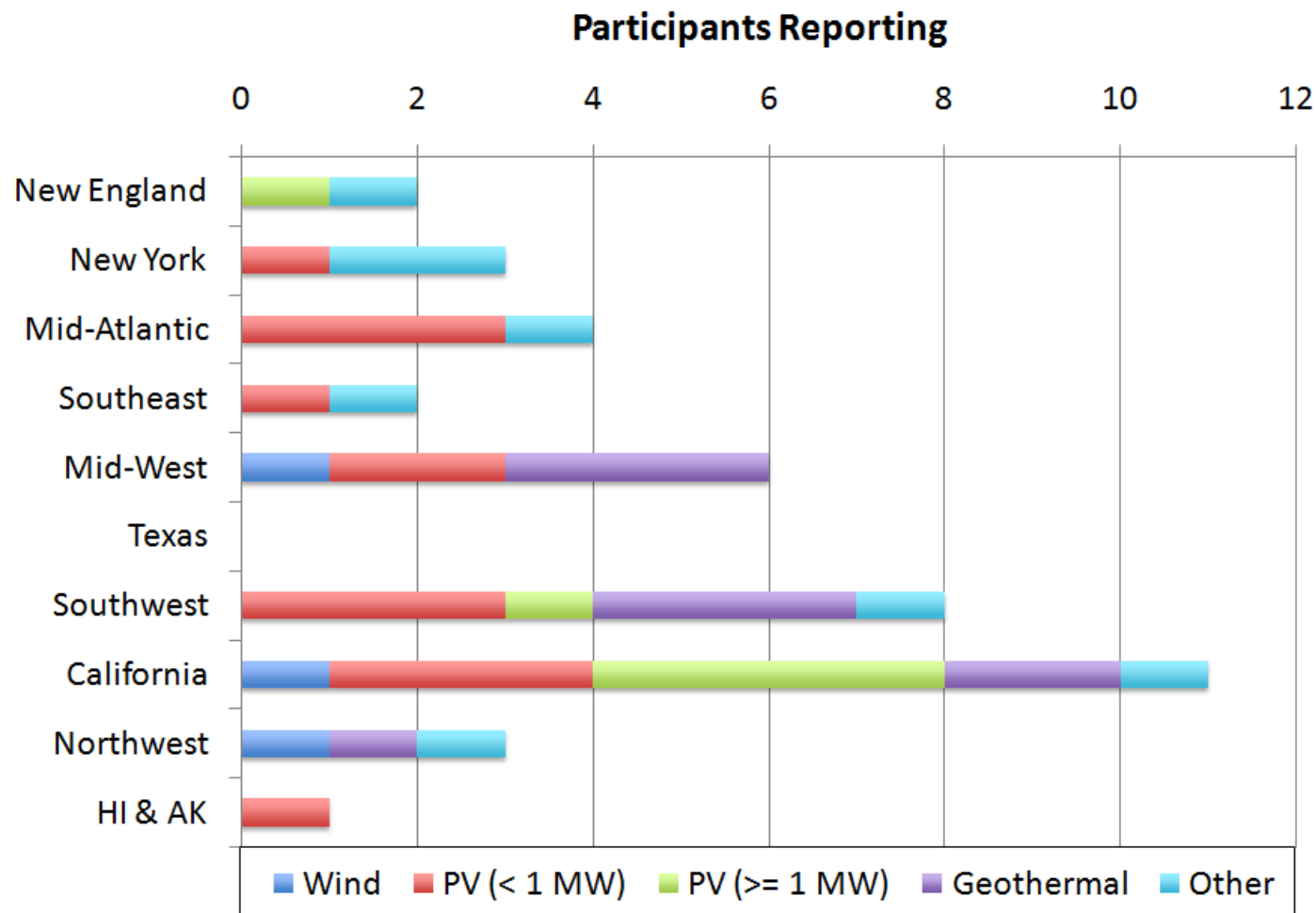
4. For projects that closed in Q4 2010, please tell us the PRIMARY LOCATION, POWER PURCHASER, and the TOTAL and DIRECT INVESTMENT...

*** Note: new \$ bins ***

	Primary Region	Primary Power Purchaser (i.e., Power Sold To)	Total Cost of Combined Projects (\$ millions)	Your Total Direct Investment (\$ millions)
Wind	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - PV (< 1 MW)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - PV (>= 1 MW)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - CSP	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar Thermal (non- elec)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Geothermal	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Biomass - Elec	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Biomass - Non-elec	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Hydro	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Other Technologies	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

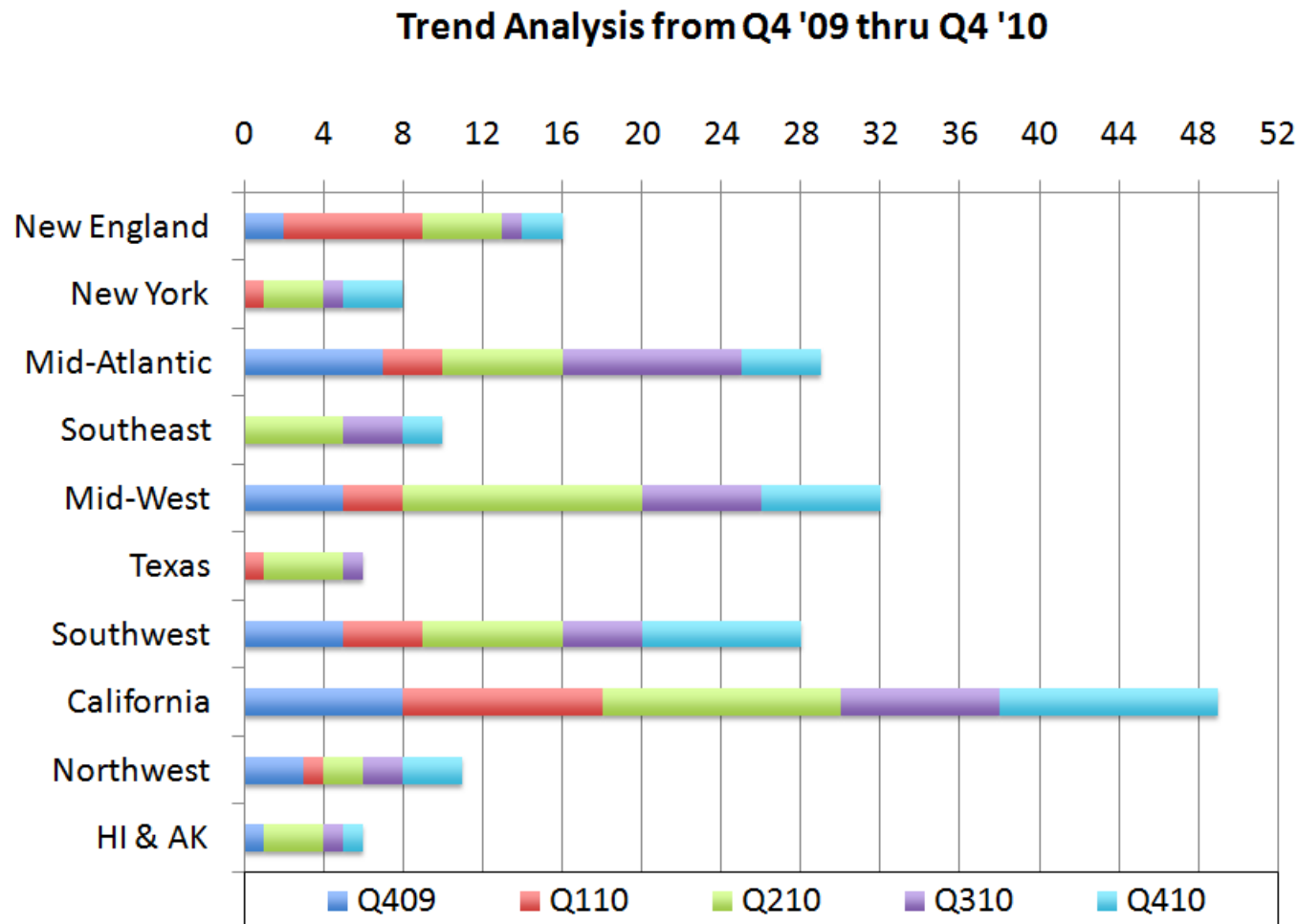
Comments

Financial Closures by Region



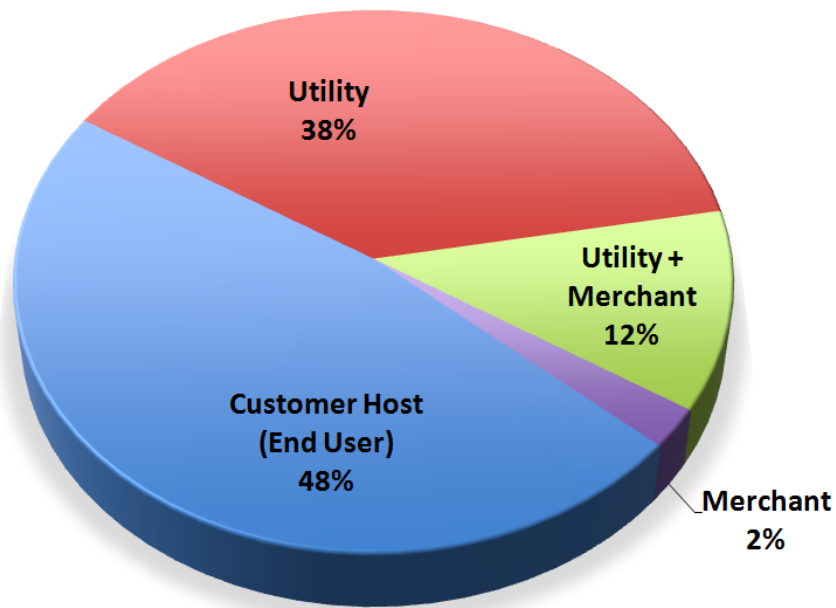
High number of REFTI participants reporting on projects in CA and southwest. All regions represented except Texas (40 total participants).

Financial Closures by Region – Trend

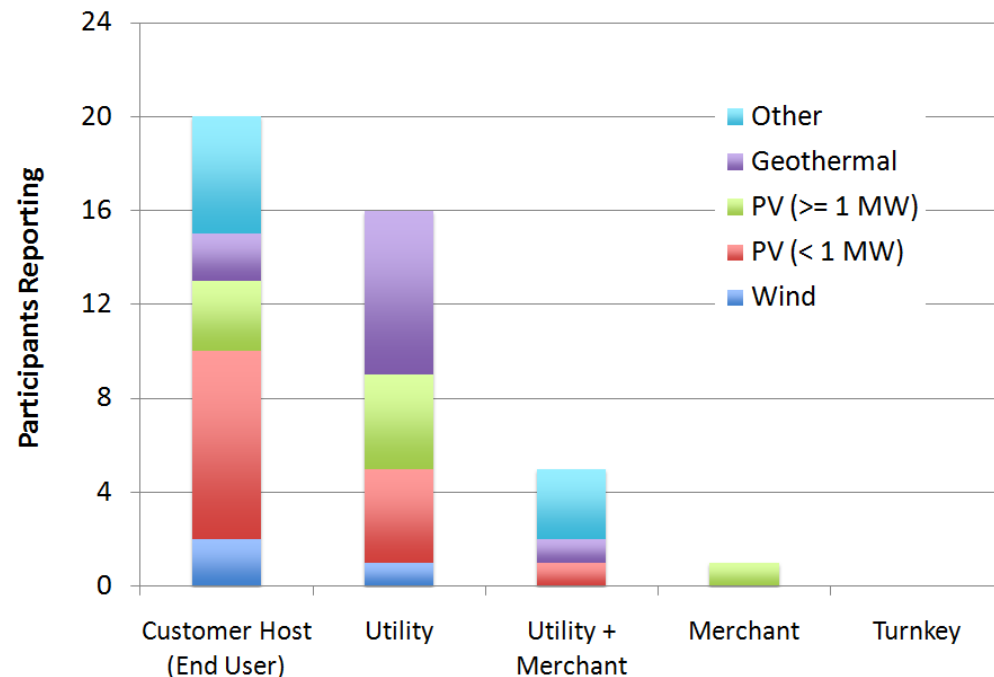


Across last 5 quarters, CA holds most projects; Mid-West and Mid-Atlantic also leading in representation

Primary Power Purchaser



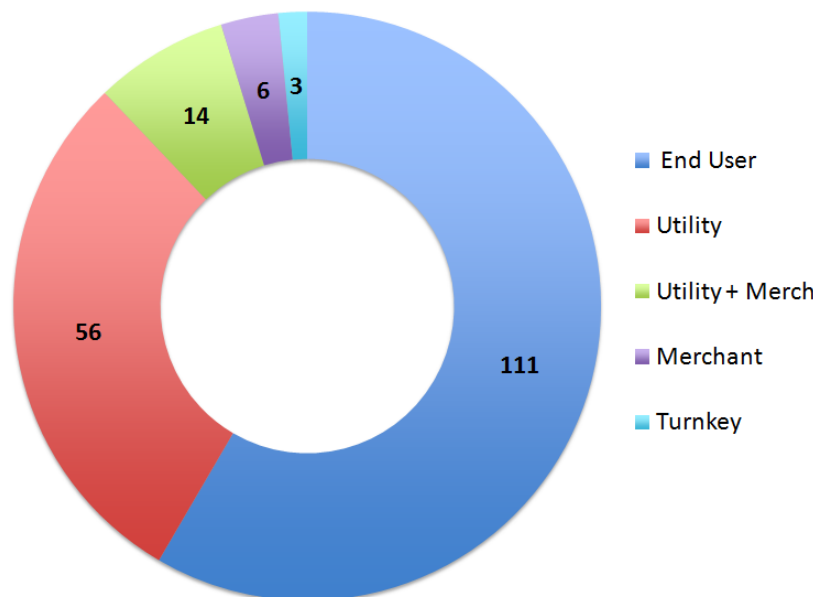
Almost half of projects reported signed PPA with customer host. About 40% reported PPAs with utilities. Essentially no merchant or turnkey sales reported



Primary Power Purchaser – Aggregate & Trend

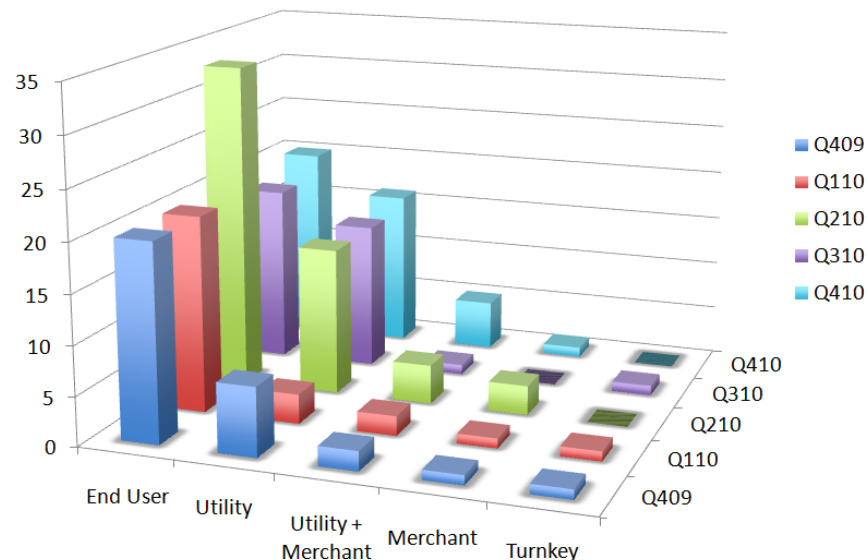
Primary Power Purchaser

Aggregate Responses from Q4 '09 thru Q4 '10



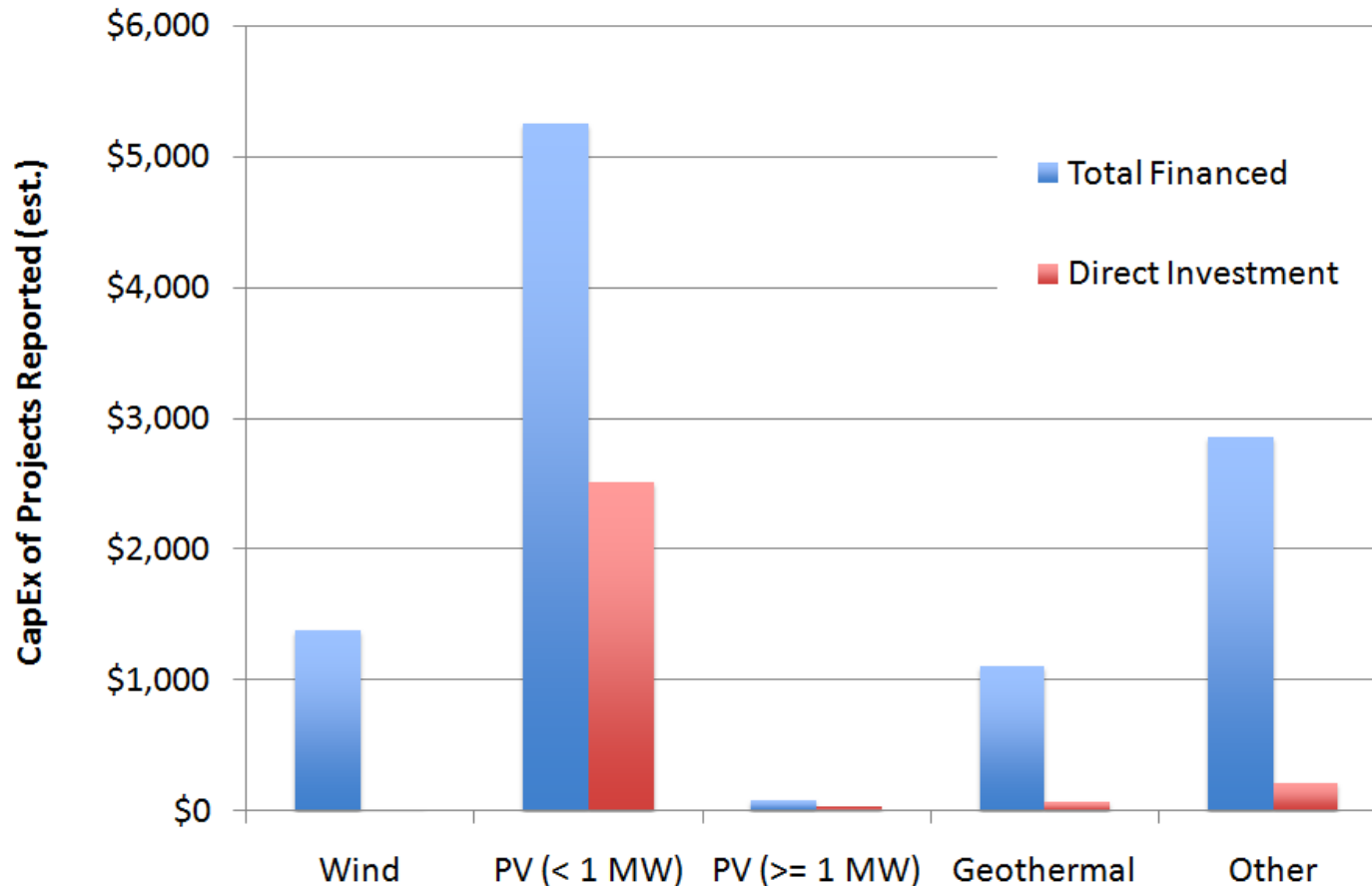
Type of Power Purchaser

Trend Analysis from Q4'09 thru Q4'10



Most projects reported signed PPA with customer host. PPA with utility second most common transaction type

Capital Expenditure Reported (\$MM)



REFTI participants reported \$10.7 B of projects in development, \$2.8 B of direct finance coming from REFTI participants.

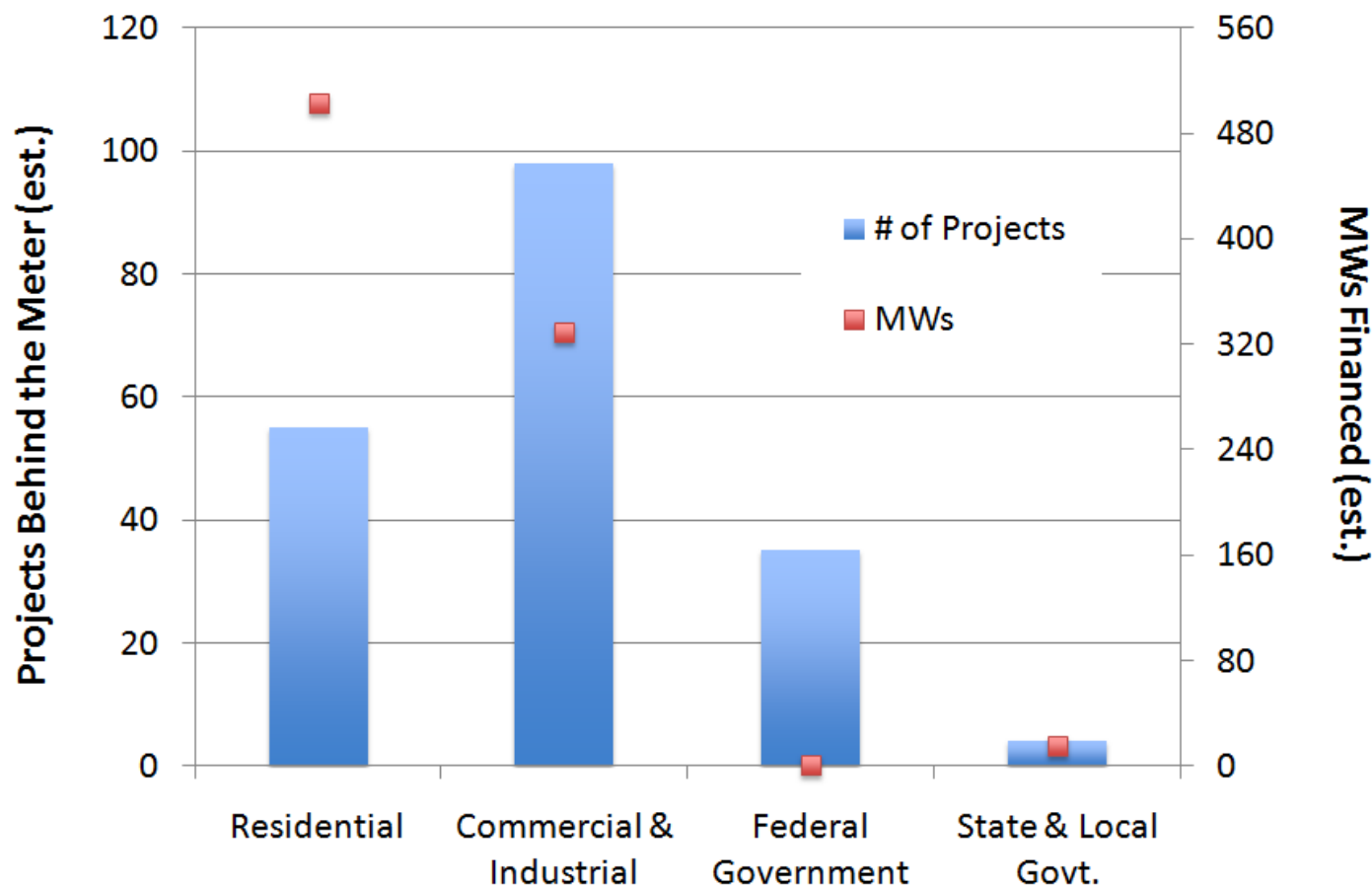
** Values estimated based on mid-point of questionnaire bins

REFTI Questionnaire: Q5

5. For your projects that are BEHIND-THE-METER, please tell us about the customer host (end user)...

	Number of Deals	Nameplate Capacity (aggregate MW)	Typical Customer Financing Structure	Avg. Customer Payback (yrs)	Avg. Customer Discount Rate (%)
Residential	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Commercial & Industrial	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Federal Government	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
State & Local Govt.	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Comments					
<div></div>					

No. & MWs of Projects with Customer Host

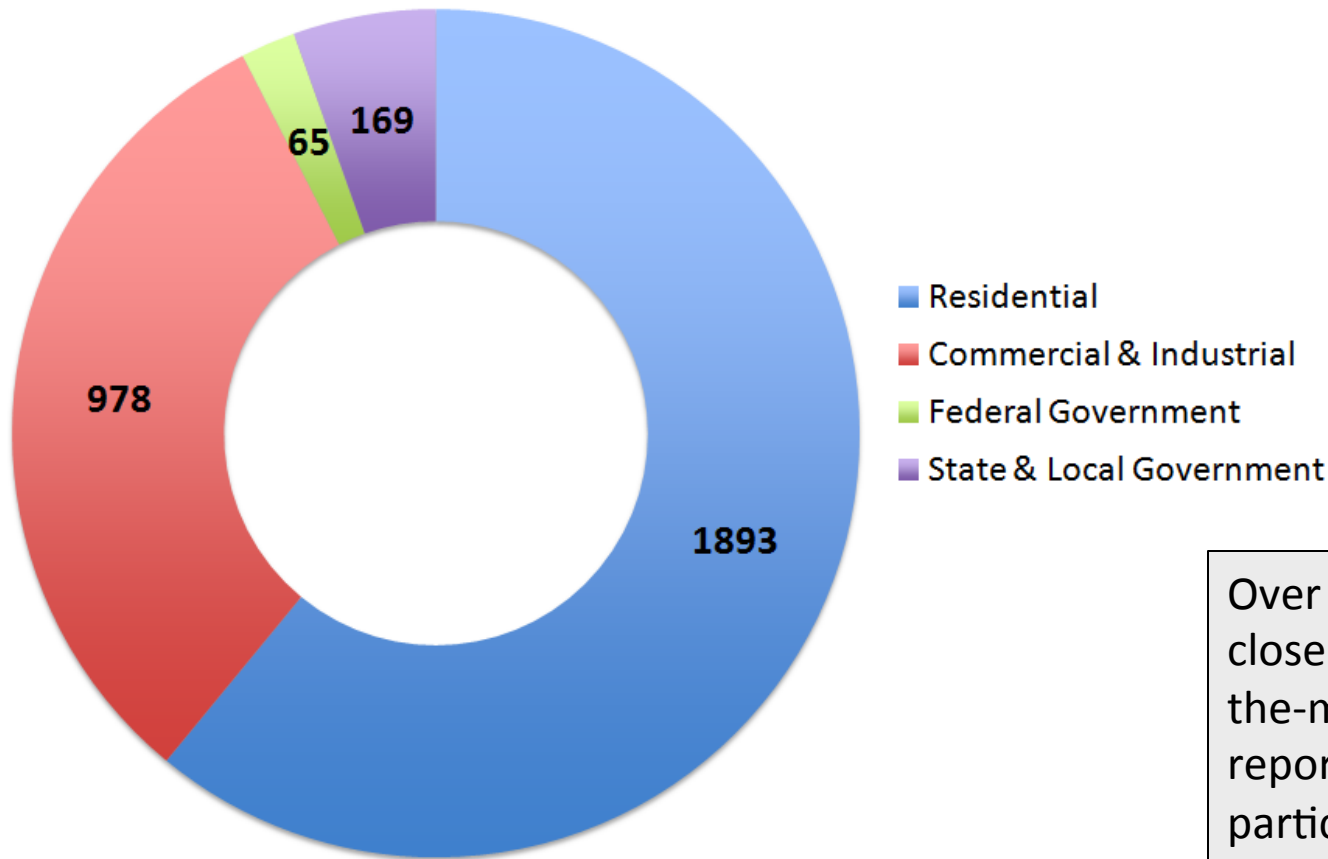


Roughly 192 projects, representing 849 MW, reported with customer host. 25 participants responding. ** Values estimated based on mid-point of questionnaire

Behind-Meter Projects by Sector - Aggregate

Approx. # of Projects Reported

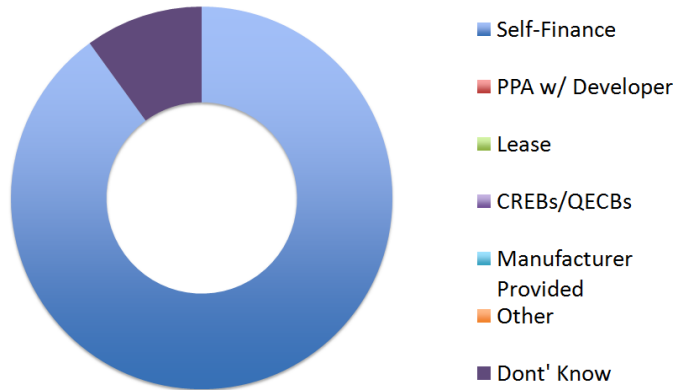
Aggregate Responses from Q4 '09 thru Q4 '10



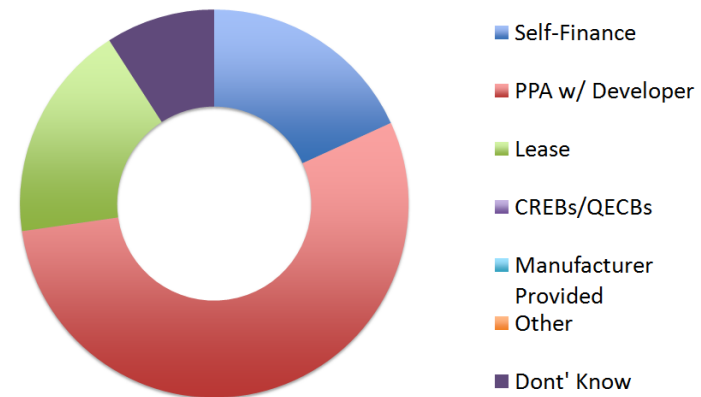
Over last 5 quarters, close to 3,000 behind-the-meter projects reported by REFTI participants, almost 2/3 residential

Form of Customer Host Financing

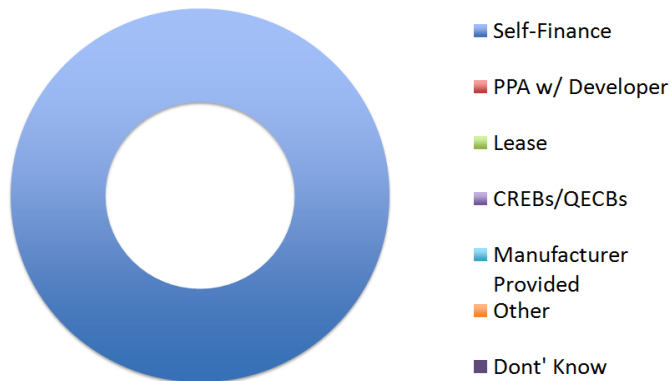
**Typical Finance Structure: Residential
Q4'10**



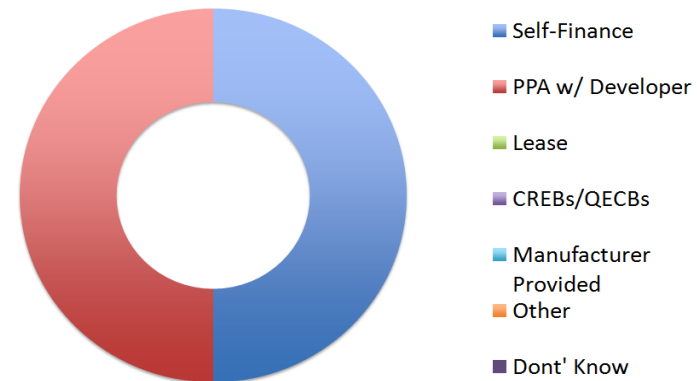
**Typical Finance Structure: C&I
Q4'10**



**Typical Finance Structure: Federal Government
Q4'10**

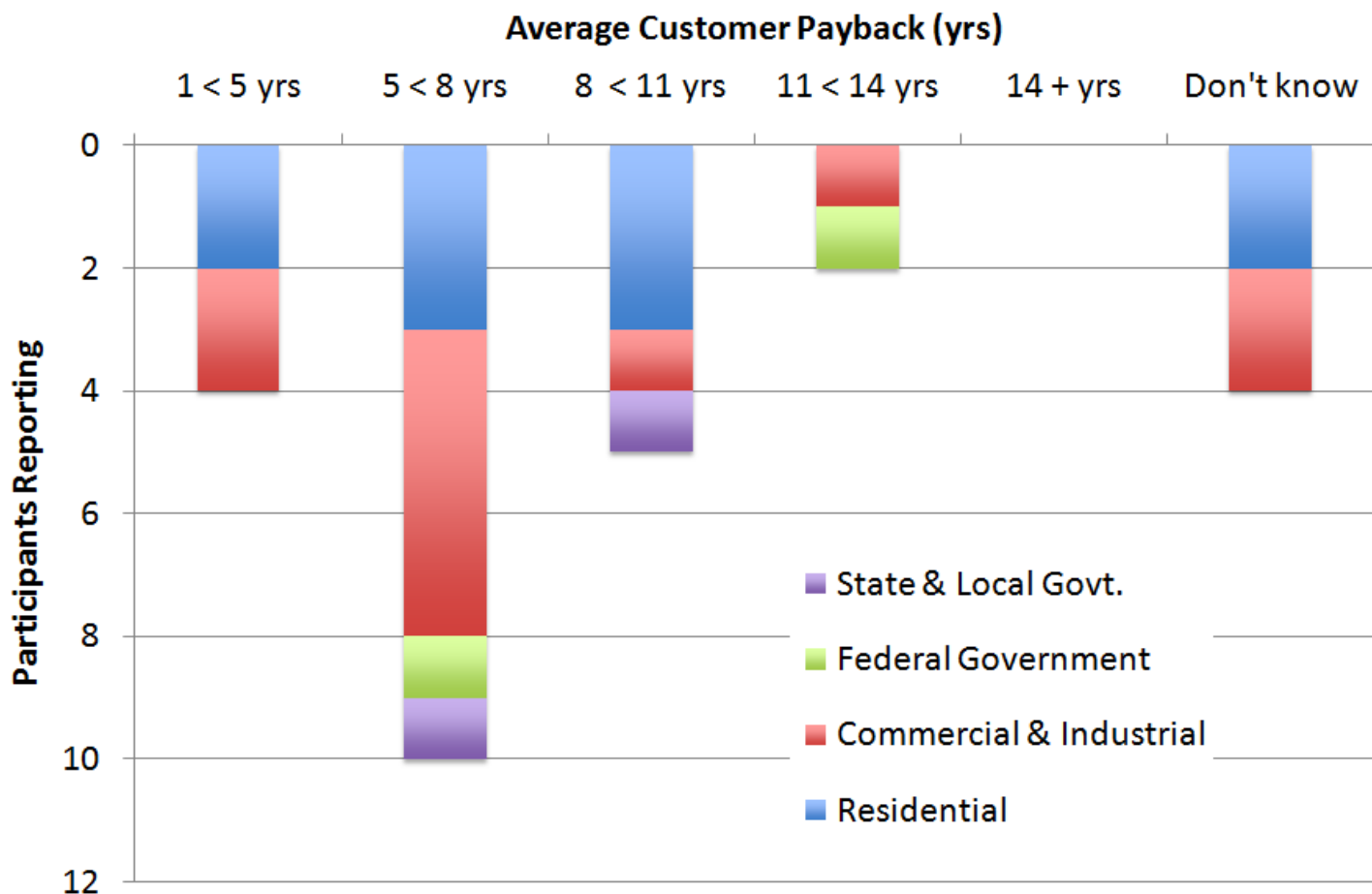


**Typical Finance Structure: State & Local Gov.
Q4'10**



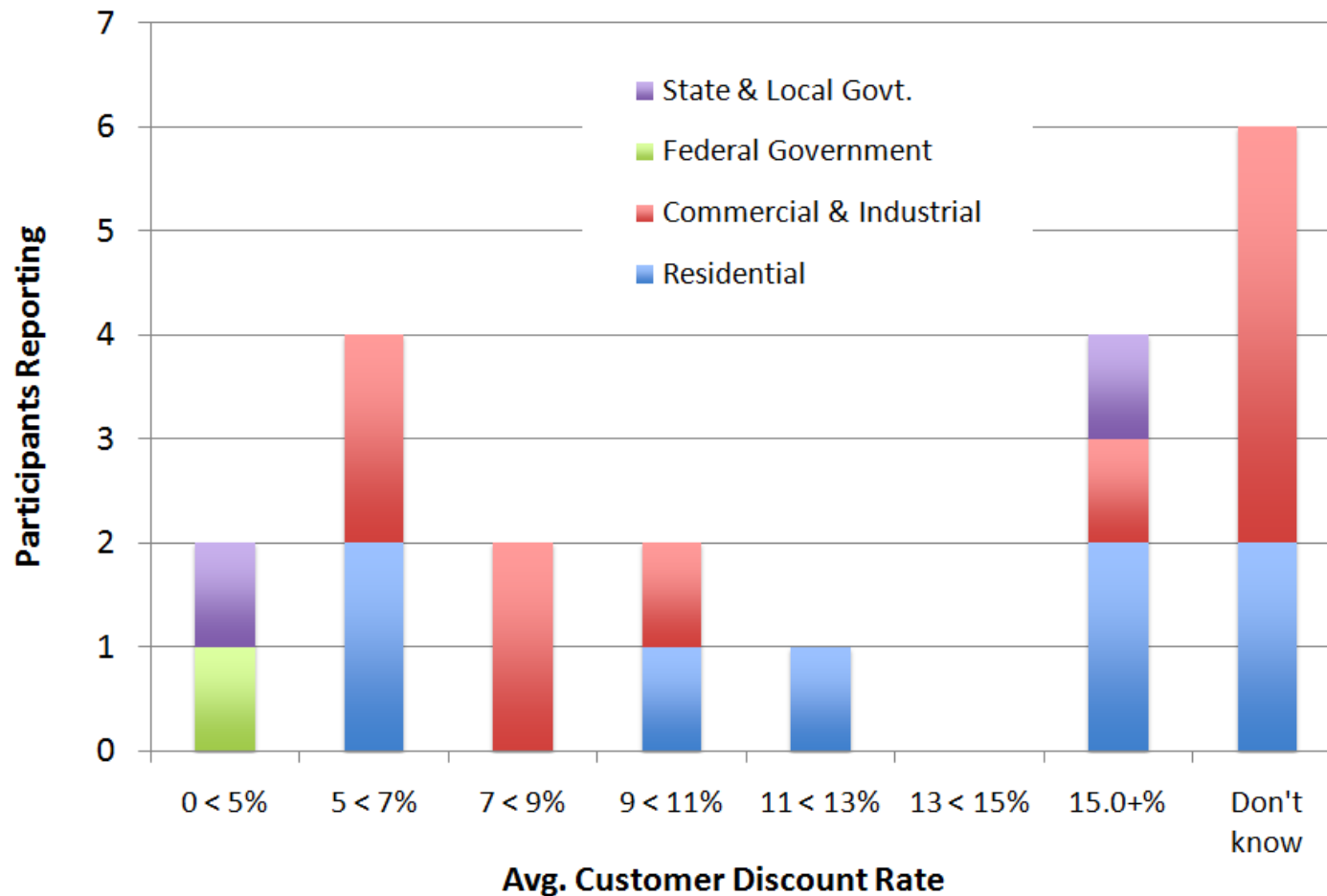
REFTI participants reporting C&I deals primarily financed via PPA with developer

Customer Host Payback (Yrs)



Most projects have payback less than 8 years. Still very few deals at Federal level reported.

Customer Host Discount Rate



Customer discount had very broad range this quarter (was tighter in prior quarters). Fairly high “don’t knows” as expected

REFTI Questionnaire: Page 2, Q4 (Q6)

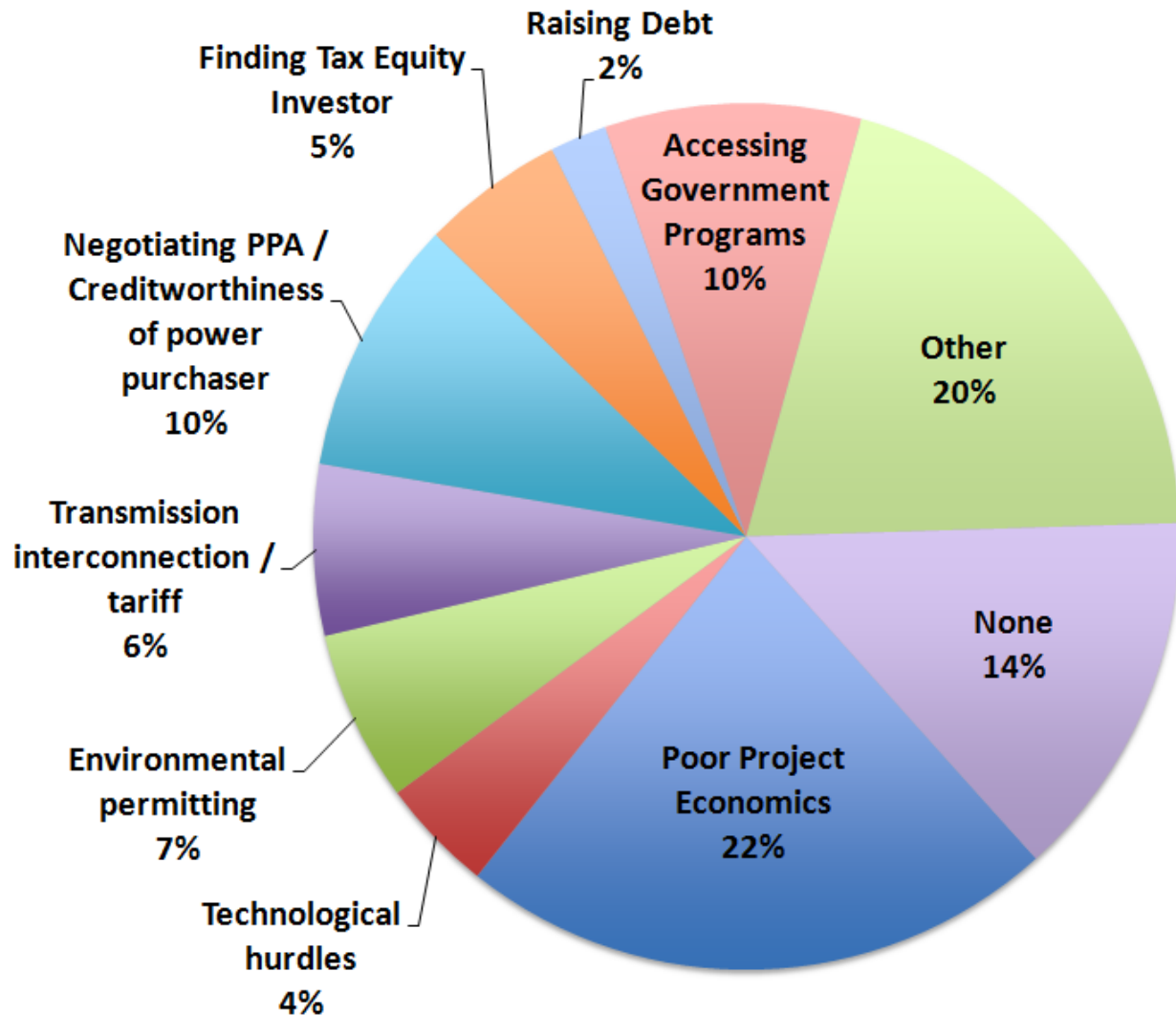
6. What was the LARGEST BARRIER to RE project development and how did it impact your projects

	Barrier	Impact
Wind	<input type="text"/>	<input type="text"/>
Solar - PV (< 1 MW)	<input type="text"/>	<input type="text"/>
Solar - PV (>= 1 MW)	<input type="text"/>	<input type="text"/>
Solar - CSP	<input type="text"/>	<input type="text"/>
Solar Thermal (non-elec)	<input type="text"/>	<input type="text"/>
Geothermal	<input type="text"/>	<input type="text"/>
Biomass - Elec	<input type="text"/>	<input type="text"/>
Biomass - Non-elec	<input type="text"/>	<input type="text"/>
Hydro	<input type="text"/>	<input type="text"/>
Other Technologies	<input type="text"/>	<input type="text"/>

Comments

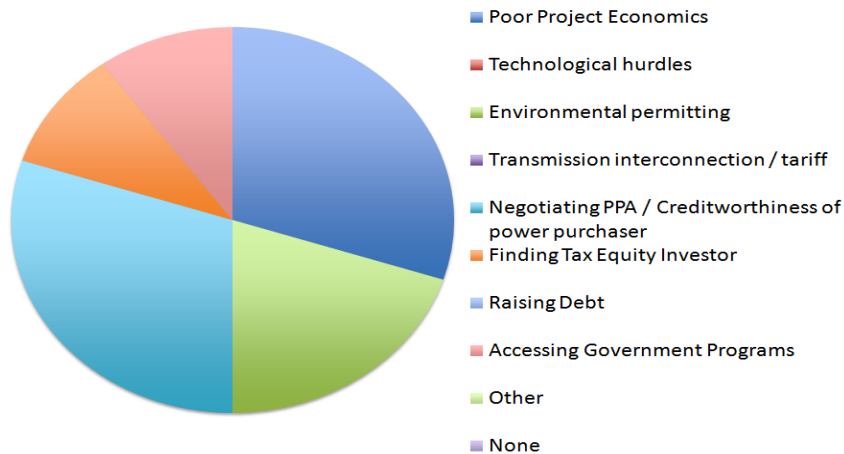
Largest Barriers to RE Development

Far lower financing-related barriers referenced by respondents. Poor project economics makes up significant fraction. Also 20% referenced "Other"

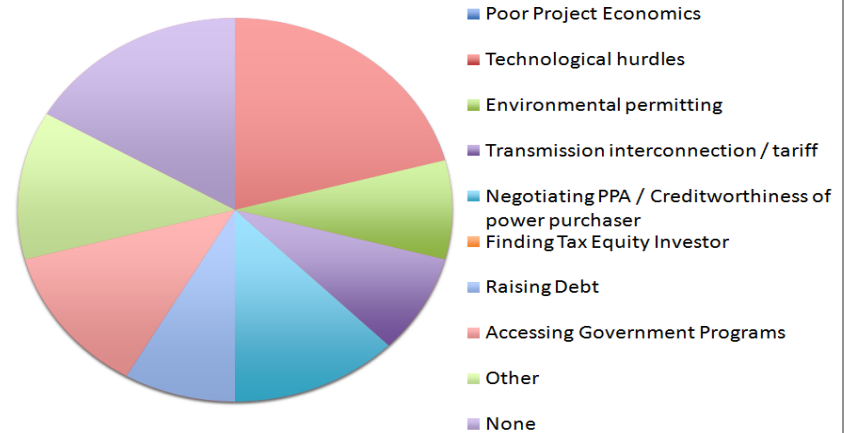


Largest Barriers – Tech Breakout

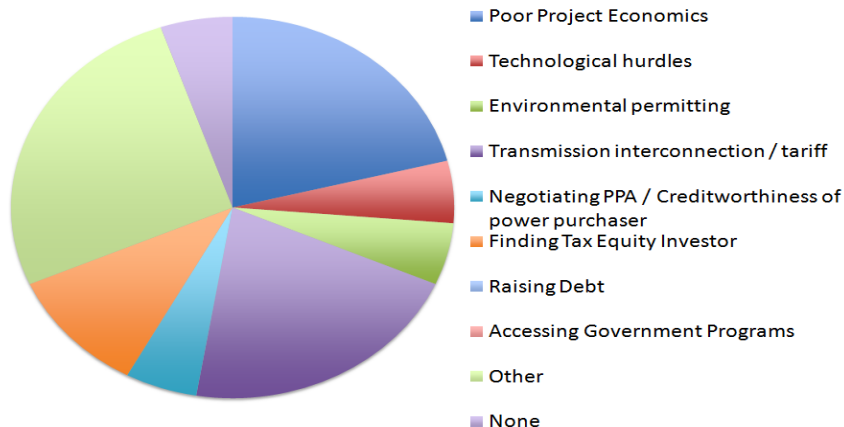
Wind



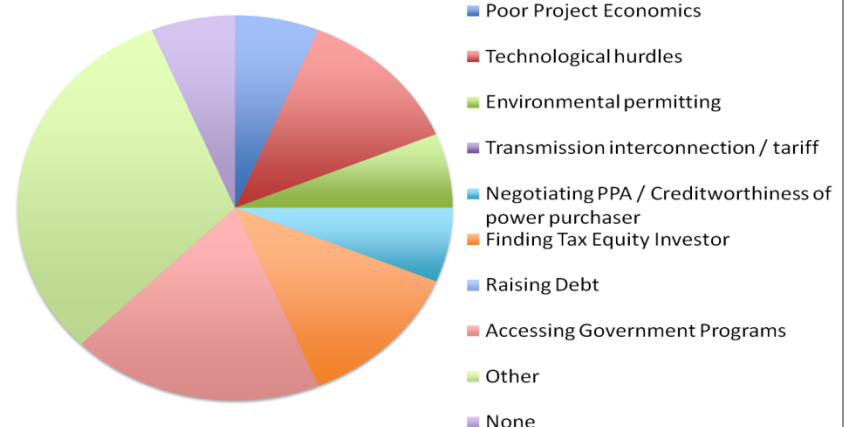
PV (< 1MW)



PV (> 1MW)

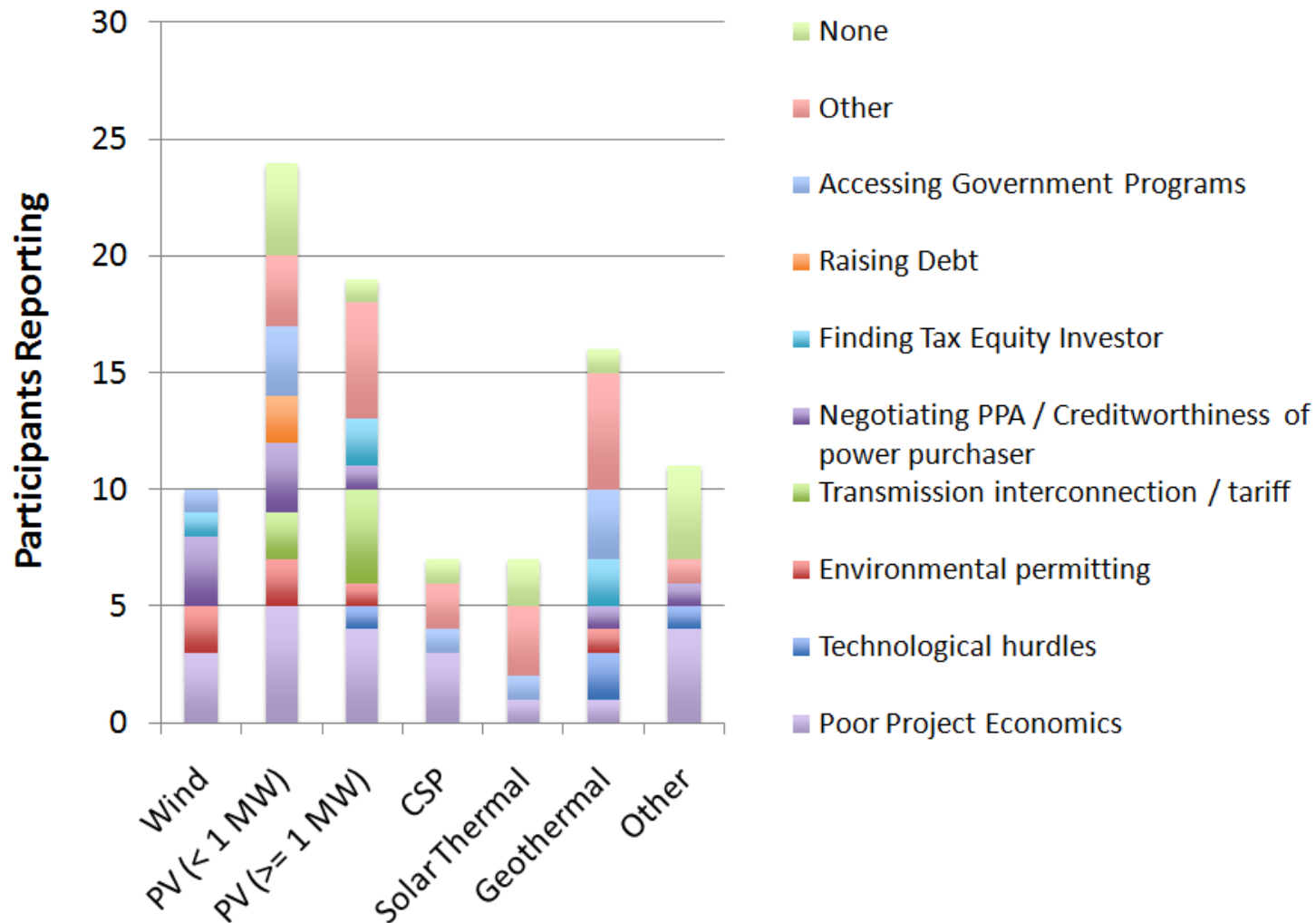


Geothermal



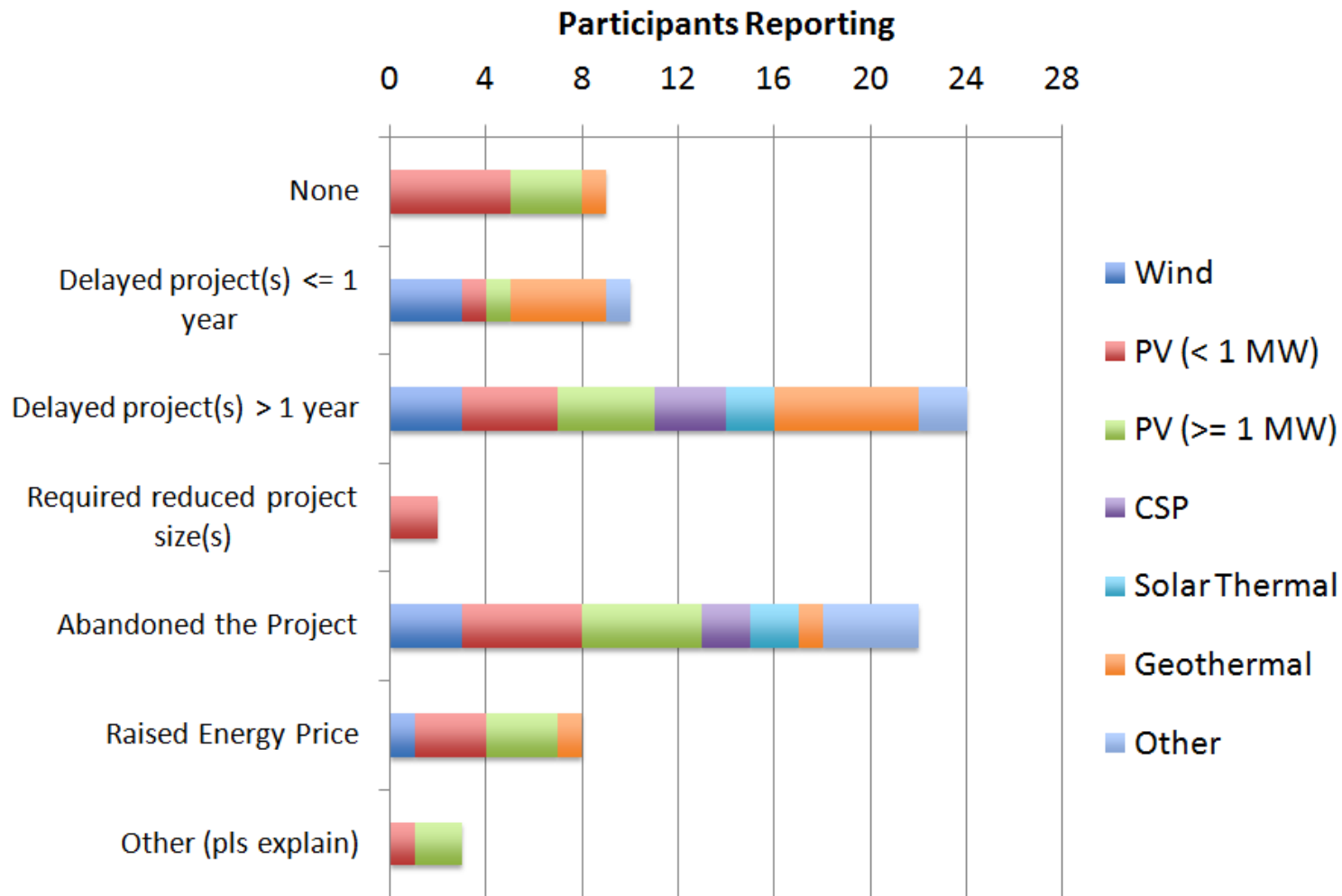
Wind hindered by poor project economics and negotiating PPA; Large PV transmission interconnection, geothermal accessing govt. programs, other

Largest Barriers – Tech Breakout



No single barrier dominating – more of series of issues to overcome

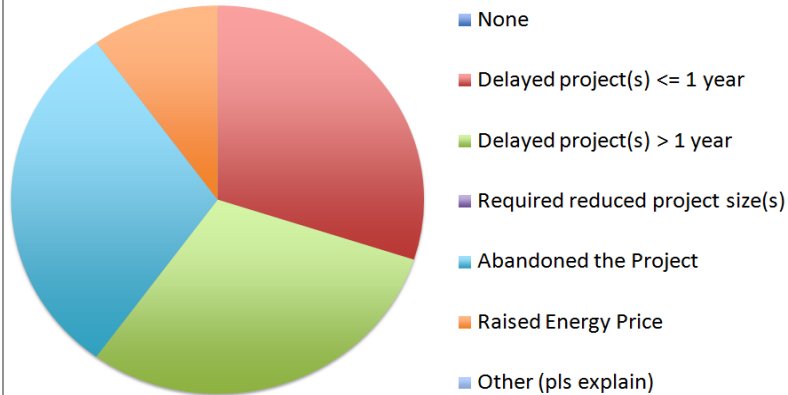
Consequence of Development Barrier(s)



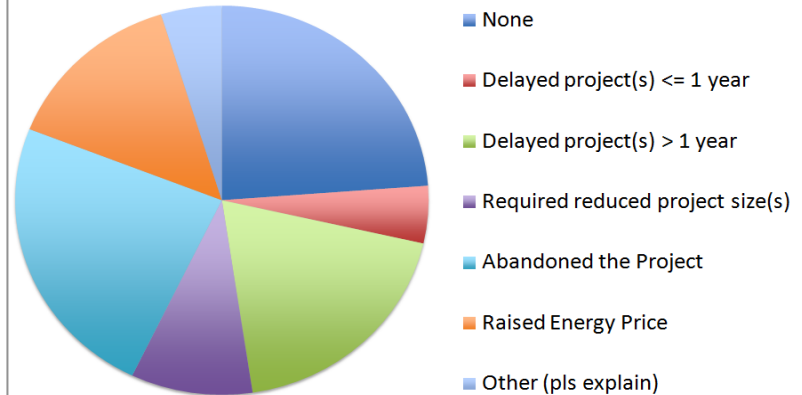
Most common consequence was extended project delay (> 1 year) and project abandonment

Consequence of Barriers – Tech Breakout

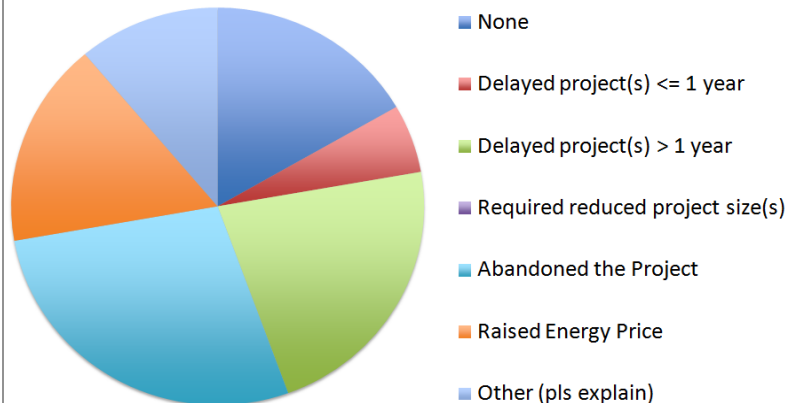
Wind



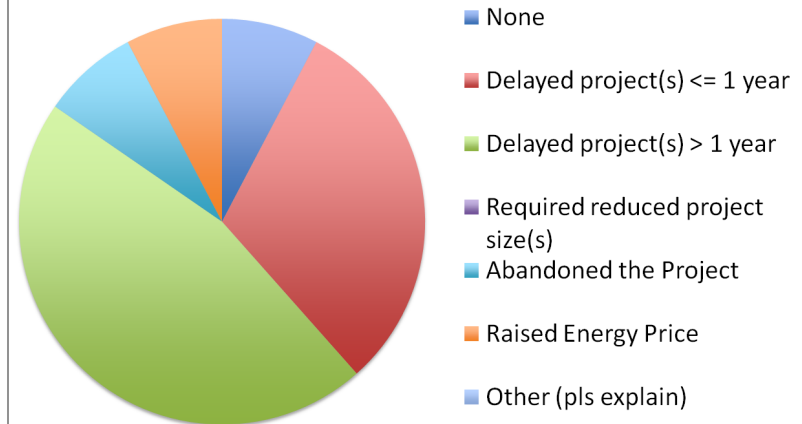
PV (<1MW)



PV (>1MW)



Geothermal



Project abandonment commonly referenced by wind, and small and large PV. Geothermal projects commonly delayed more than 1 year

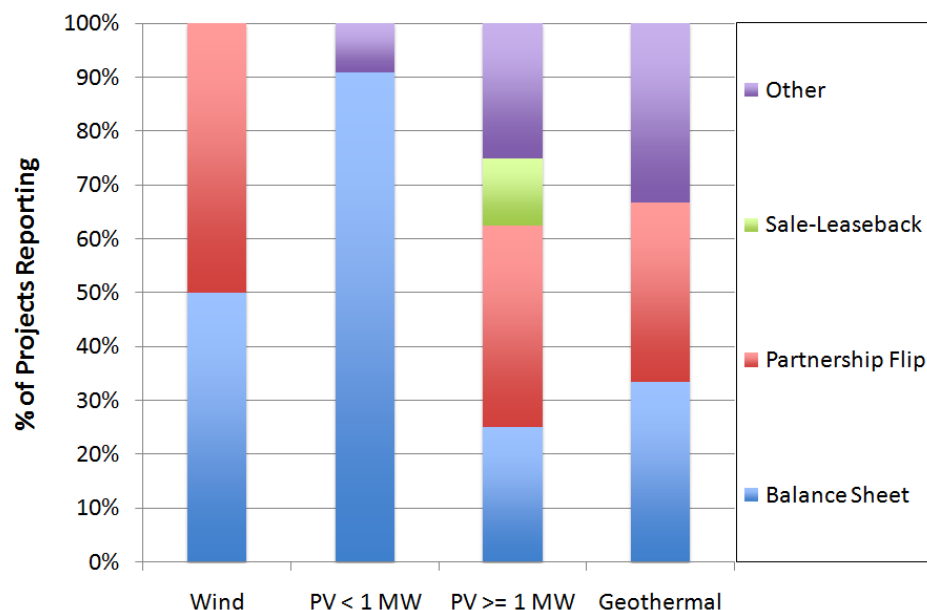
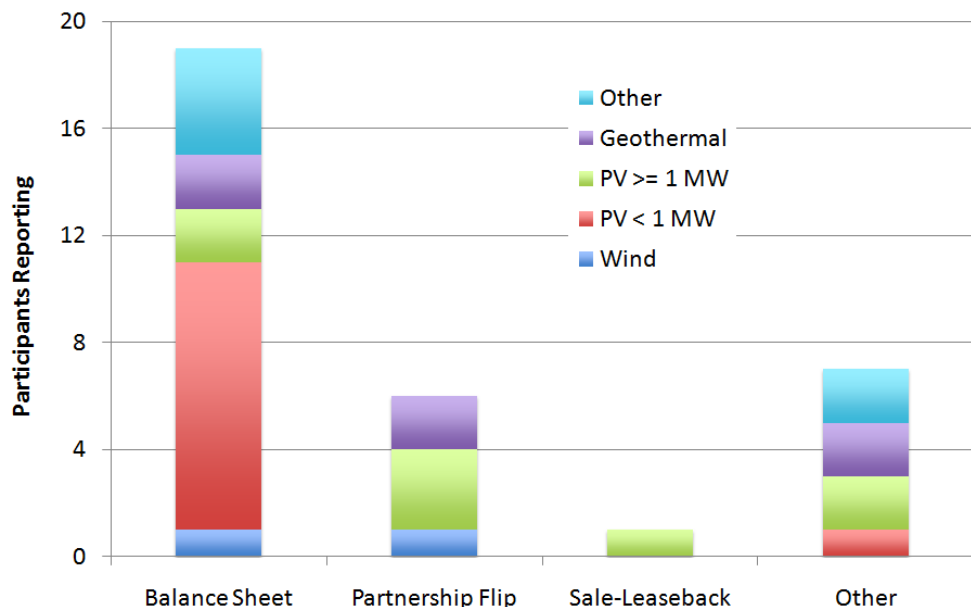
REFTI Questionnaire: Q7 (p. 3 – Financing)

7. Select the primary typical FINANCIAL STRUCTURE characteristics of your projects that closed in prior quarter...

	Financial Structure	Depreciation	Federal Incentive	State Incentive
Wind	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - PV (< 1 MW)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - PV (>= 1 MW)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - CSP	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar Thermal (non-elec)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Geothermal	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Biomass - Elec	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Biomass - Non-elec	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Hydro	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Other Technologies	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Comments

Financial Structure of Projects Reported

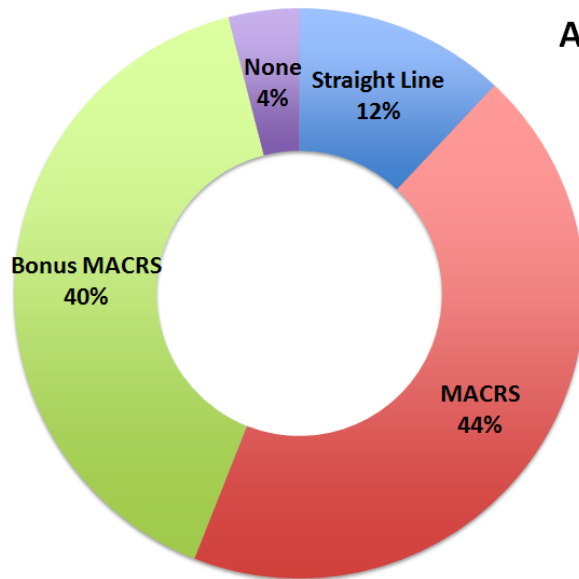


Balance sheet finance still critical for smaller projects; partnership flip more relevant for larger projects

Form of Depreciation Taken

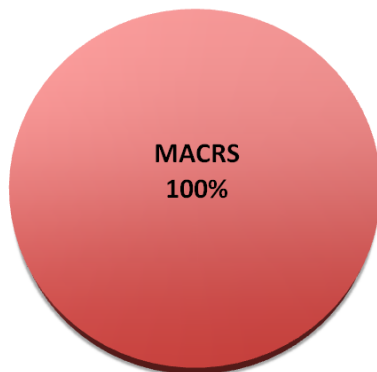


All Technologies

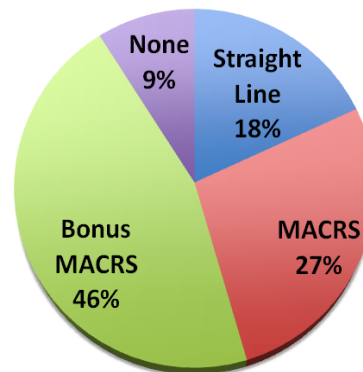


Bonus and regular MACRS evenly reported. Geothermal projects reporting use of MACRS

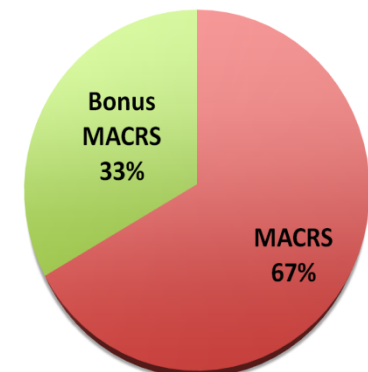
Wind



PV < 1MW

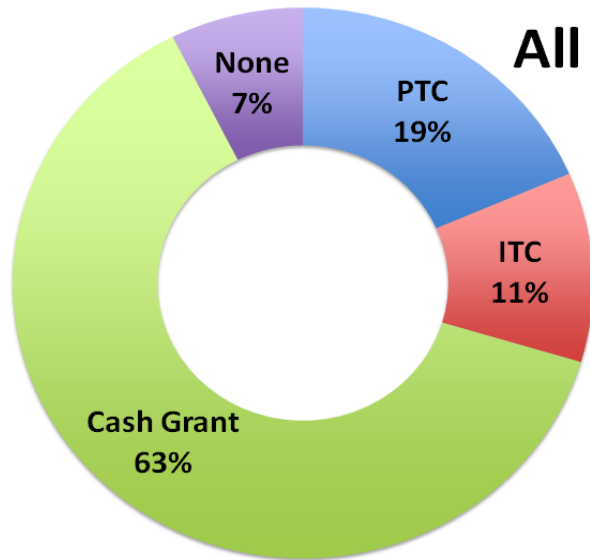


Geothermal



Form of Federal Incentive Taken

All Technologies

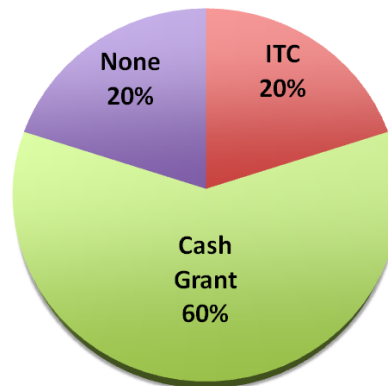


Cash grants served as primary form of federal incentive, but not for geothermal projects reporting

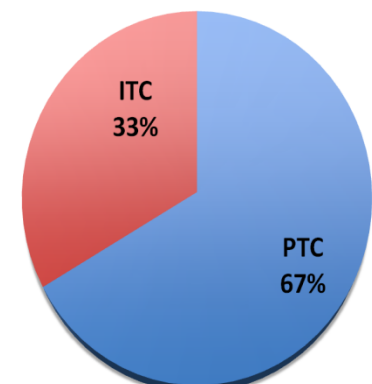
Wind



PV > 1MW



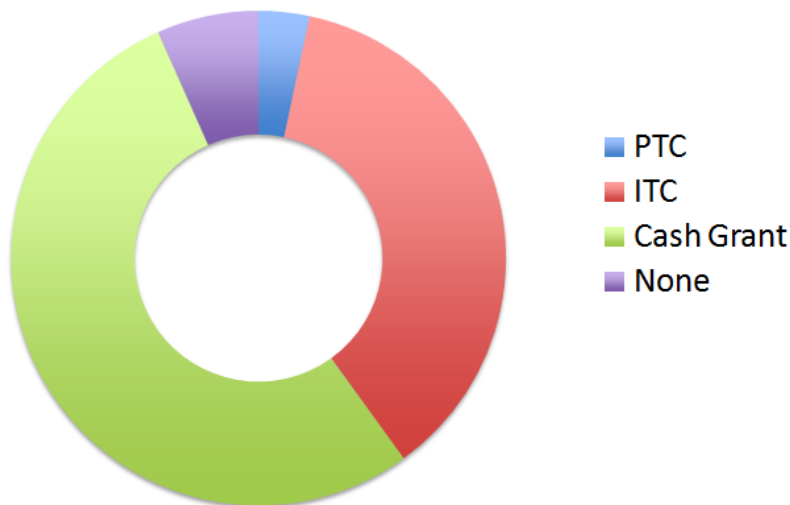
Geothermal



Federal Incentive Taken – Aggregate Analysis

Federal Incentives Taken: PV >= 1MW

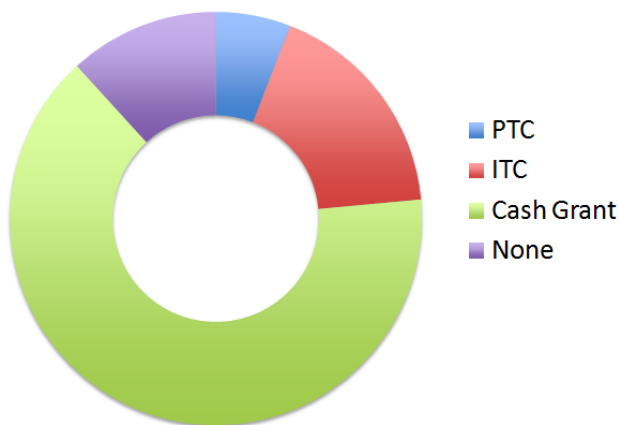
Aggregate Responses from Q4 '09 thru Q4 '10



Cash grant represents form of roughly half of the federal incentive taken over last 5 quarters of REFTI

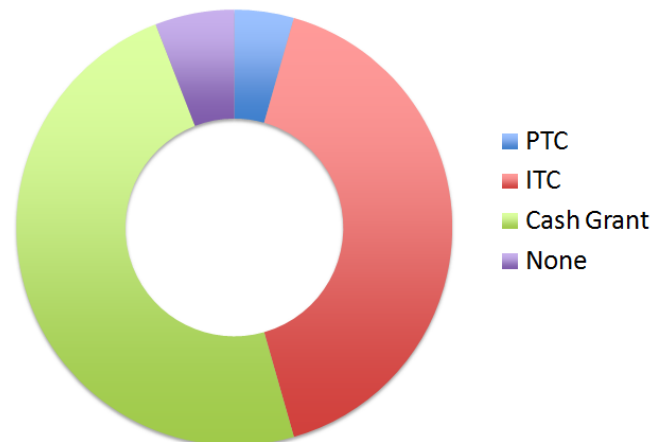
Federal Incentives Taken: Wind

Aggregate Responses from Q4 '09 thru Q4 '10



Federal Incentives Taken: PV < 1MW

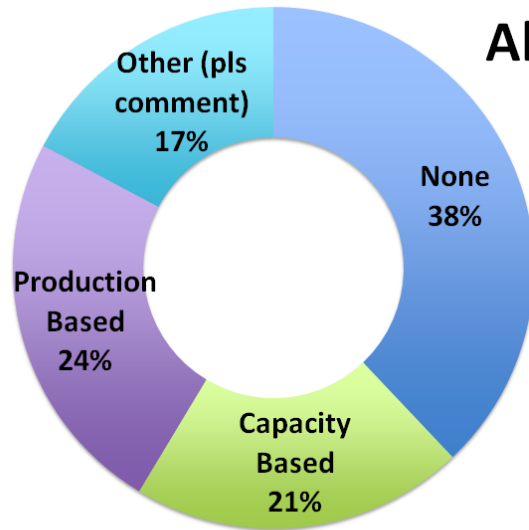
Aggregate Responses from Q4 '09 thru Q4 '10



Form of State Incentive Taken

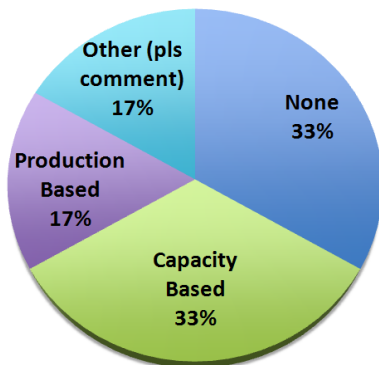


All Technologies

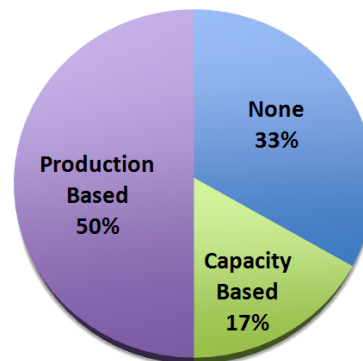


REFTI participants report about 6 in 10 receive some form of state incentive, split by capacity-based incentives, production-based incentives, and other

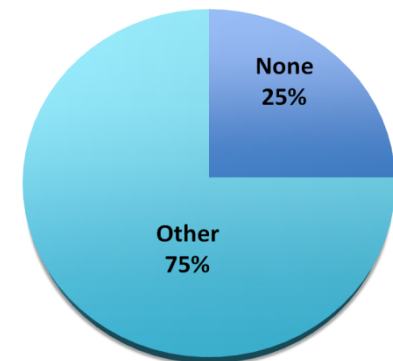
PV < 1MW



PV > 1MW



Geothermal

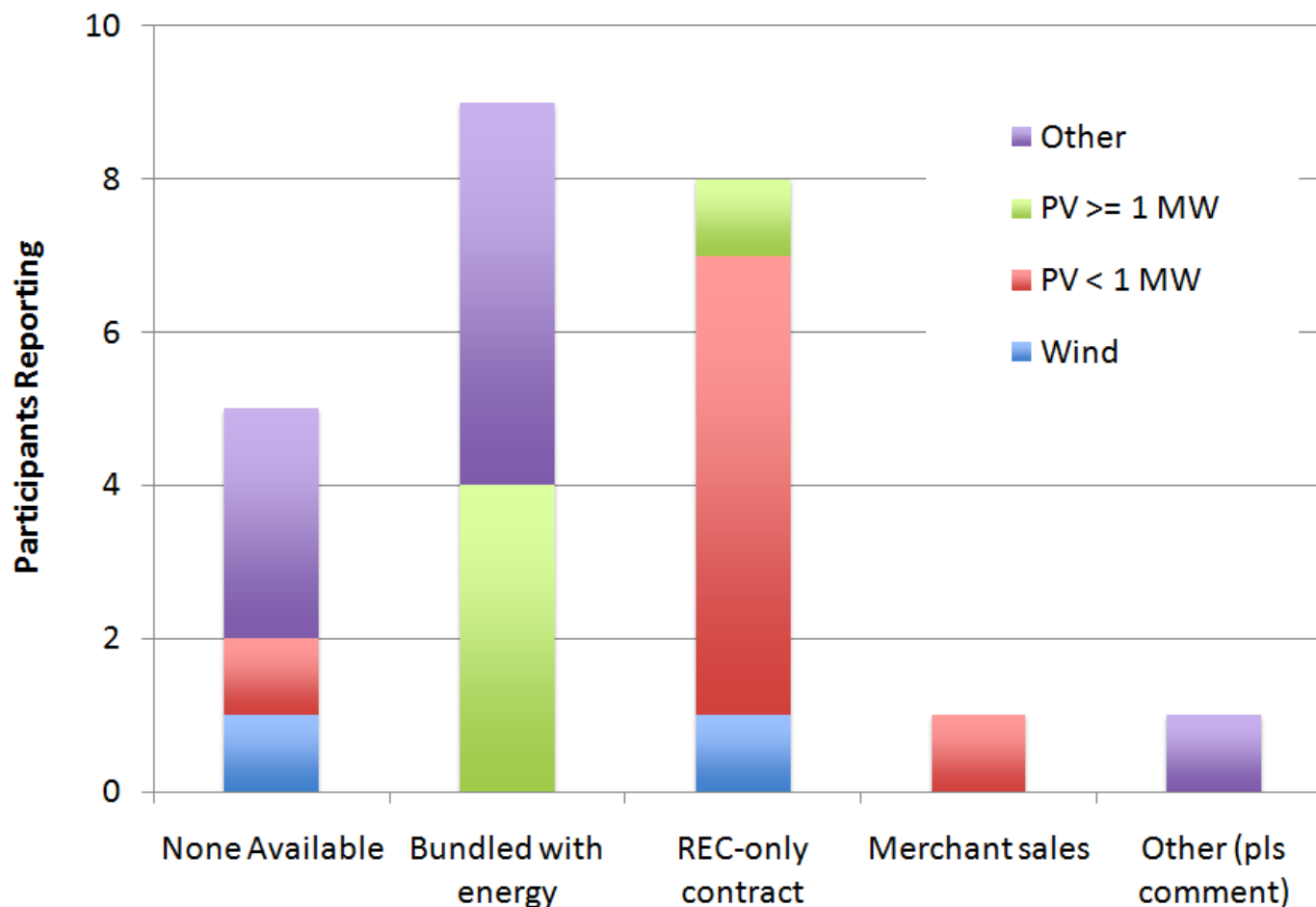


REFTI Questionnaire: Q8

8. Provide the typical expected method of REC Sales, REC Type, REC Contract Duration, and REC-only price (if applicable) by technology...

	REC Sales	REC Type	REC Contract Term (yrs)	REC-only Price (\$/MWh)
Wind	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - PV (< 1 MW)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - PV (>= 1 MW)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - CSP	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar Thermal (non-elec)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Geothermal	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Biomass - Elec	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Biomass - Non-elec	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Hydro	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Other Technologies	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Comments	<div><input type="text"/></div>			

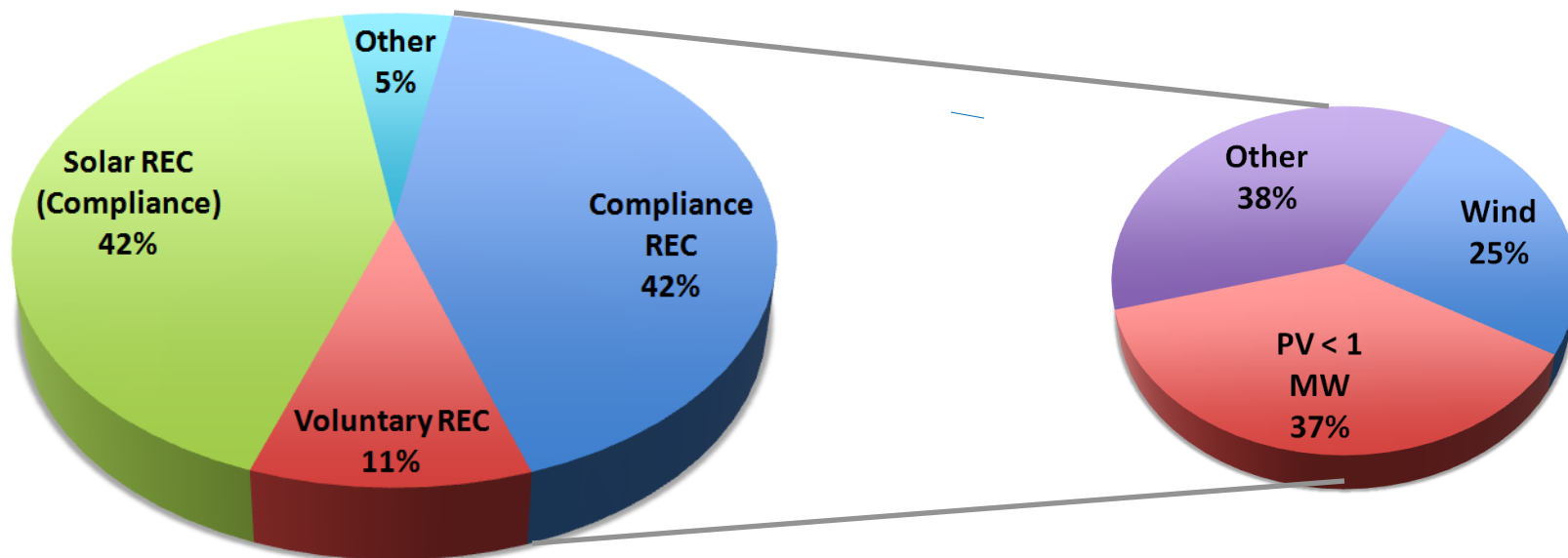
Form of REC Sales



RECs most commonly bundled with energy, but REC only contracts quite relevant, especially for small PV

Breakdown of RECs Sold

All Technologies

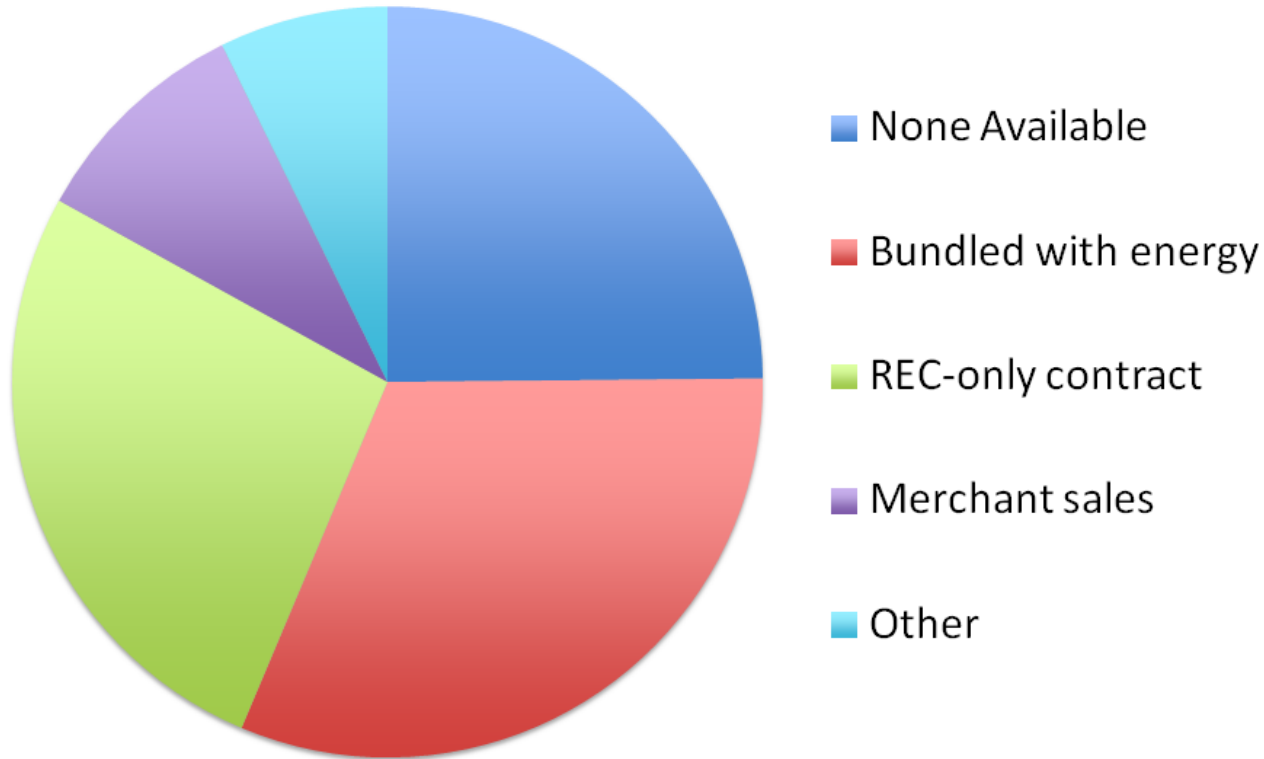


Solar RECs and technology-agnostic RECs were most relevant form of REC among REFTI participants

Form of REC Sales – Aggregate

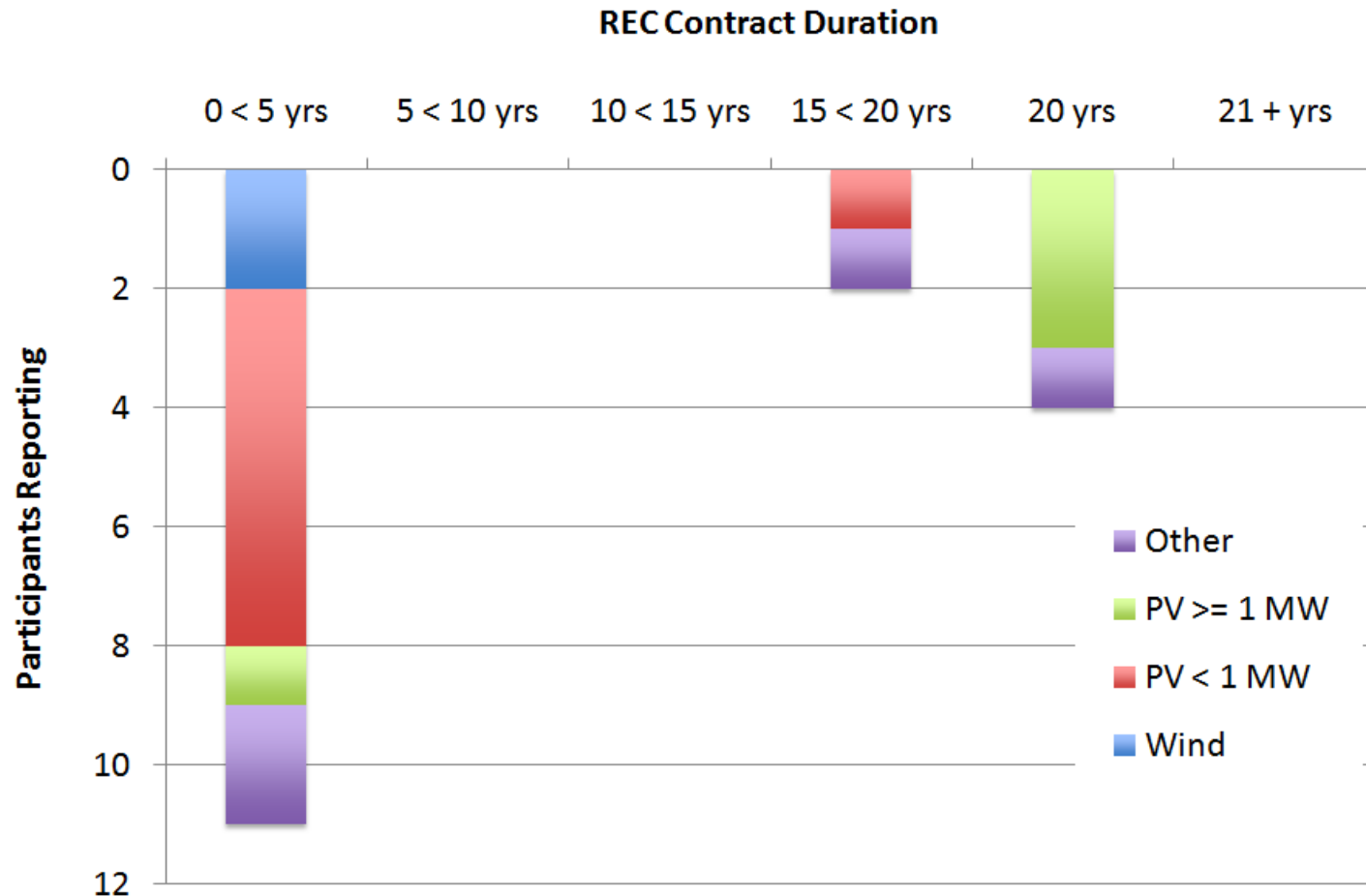
Form of REC Sales: All Technologies

Aggregate Responses from Q4 '09 - Q4 '10



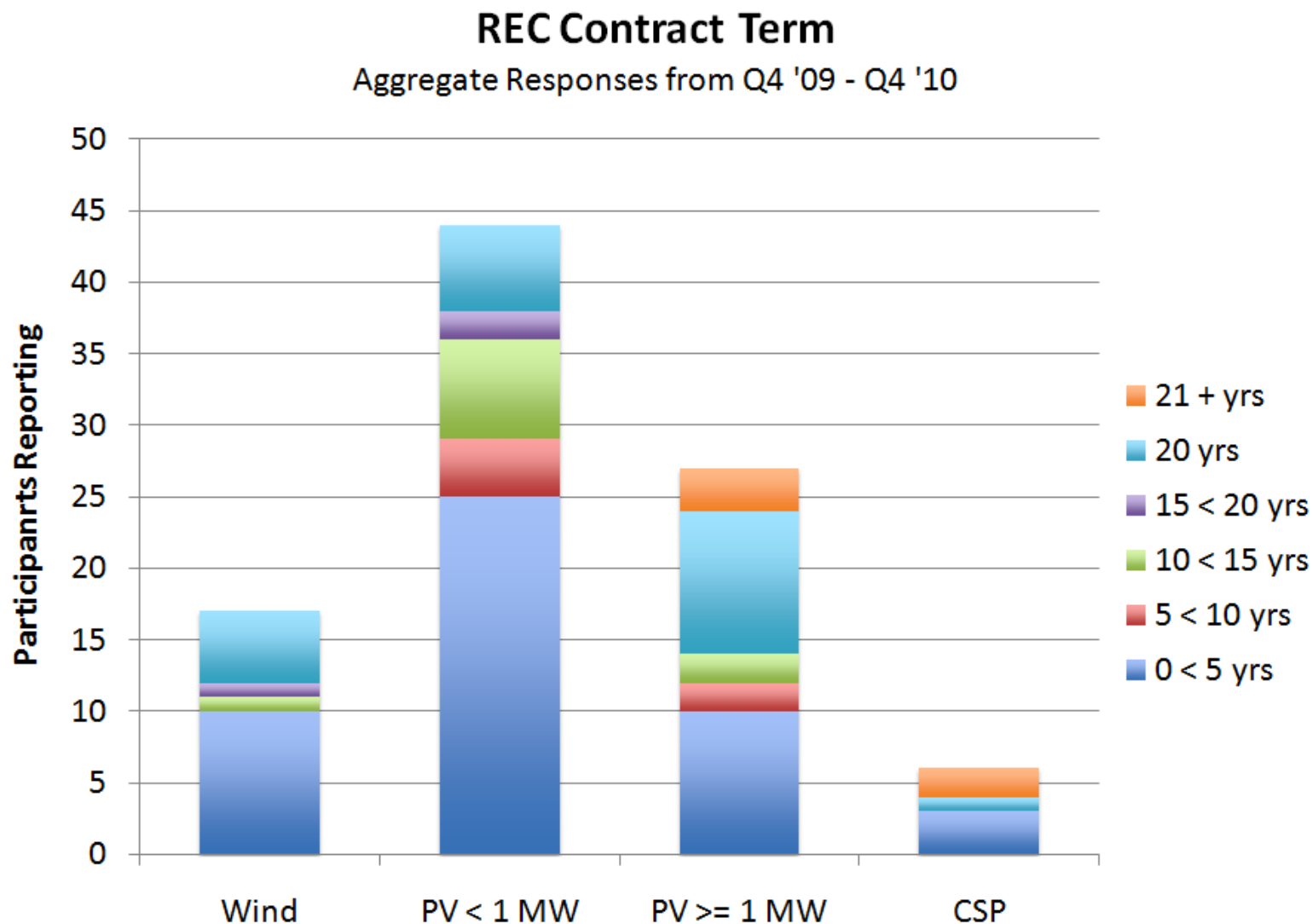
Over last 5 quarters, RECs were most commonly bundled with energy, as REC-only contracts, and none available

REC Contract Duration



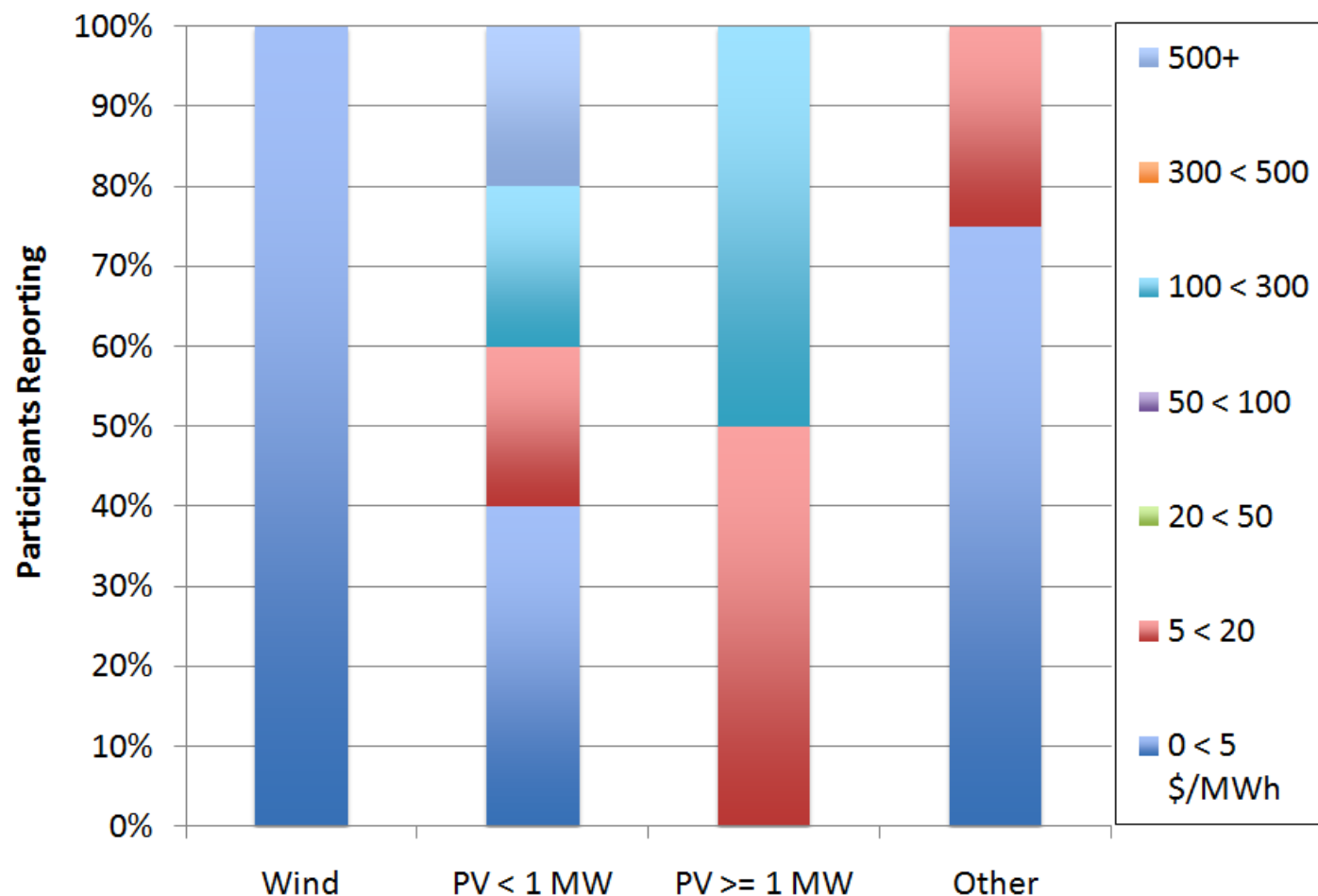
REC contracts generally very short-term (< 5 years)

REC Duration – Aggregate Analysis



REC duration most commonly < 5 years over prior 5 quarters, but 20 year contracts very relevant especially for large PV

REC-Only Price (\$/MWh)



Scaled to 100%. Small PV REC prices range from < \$5 /MWh to over \$500/MWh

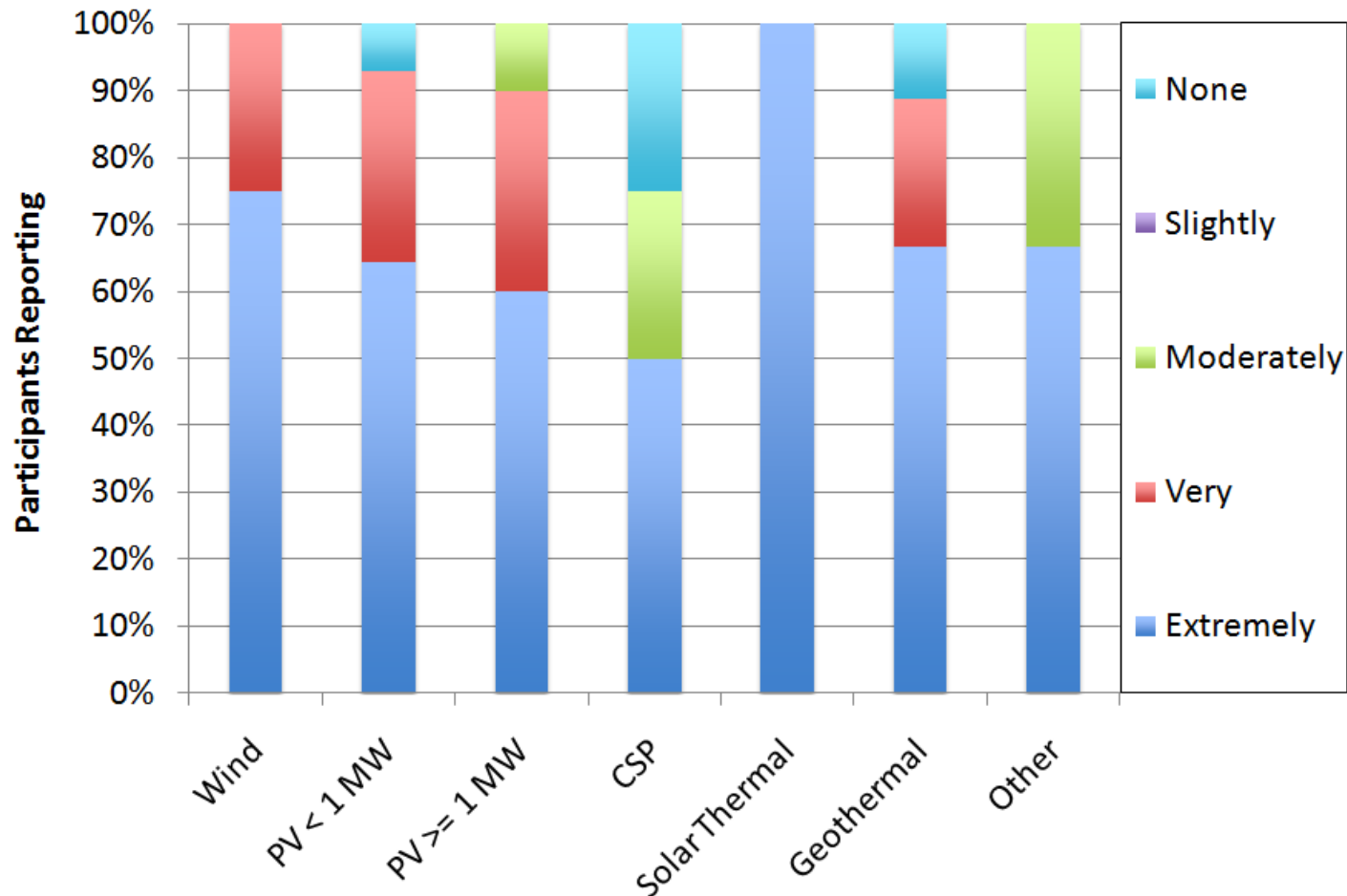
REFTI Questionnaire: Q9

9. Please comment on the **IMPORTANCE** of different **INCENTIVE PROGRAMS** to developing your projects...

	Treasury Grants	State Incentives	Renewable Portfolio Standards (REC purchase)	Loan Guarantees
Wind	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - PV (< 1 MW)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - PV (>= 1 MW)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - CSP	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar Thermal (non-elec)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Geothermal	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Biomass - Elec	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Biomass - Non-elec	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Hydro	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Other Technologies	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Comments

Importance of Treasury Grants

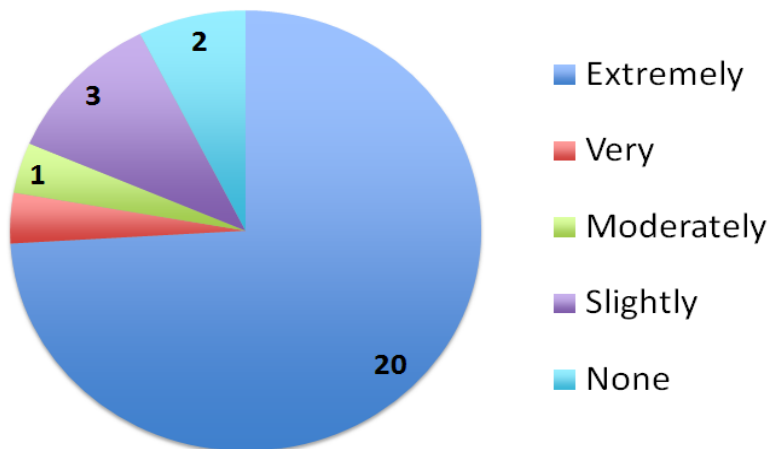


Scaled to 100%. Treasury Grants continue to be considered extremely or very important for all technologies. Some in development of CSP and other technologies did indicate no importance of Treasury Grants

Treasury Grant Importance – Aggregate by Tech

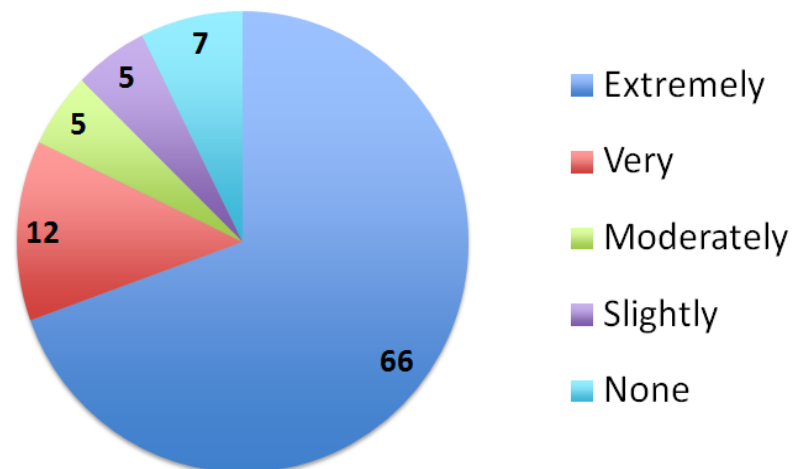
Importance of Treasury Grant: Wind

Aggregate Responses from Q4 '09 thru Q4 '10



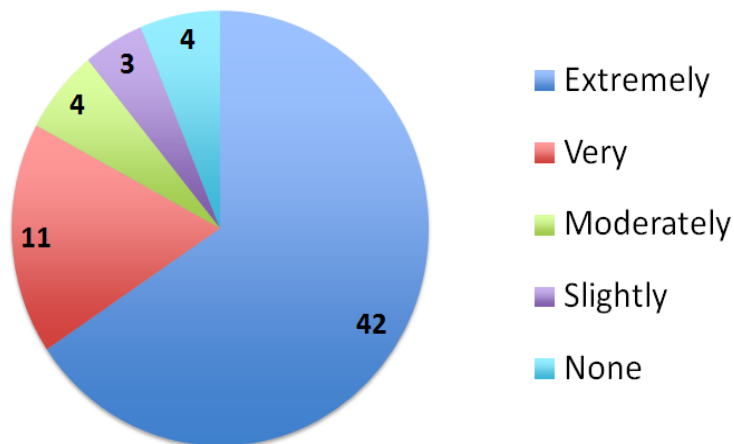
Importance of Treasury Grant: PV < 1MW

Aggregate Responses from Q4 '09 thru Q4 '10



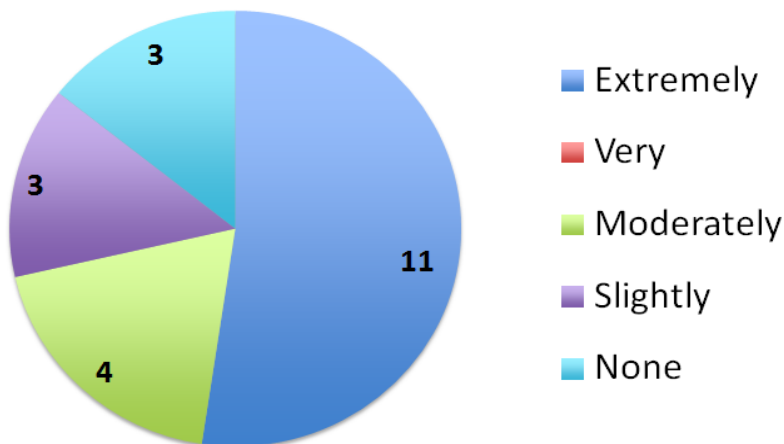
Importance of Treasury Grant: PV >= 1MW

Aggregate Responses from Q4 '09 thru Q4 '10

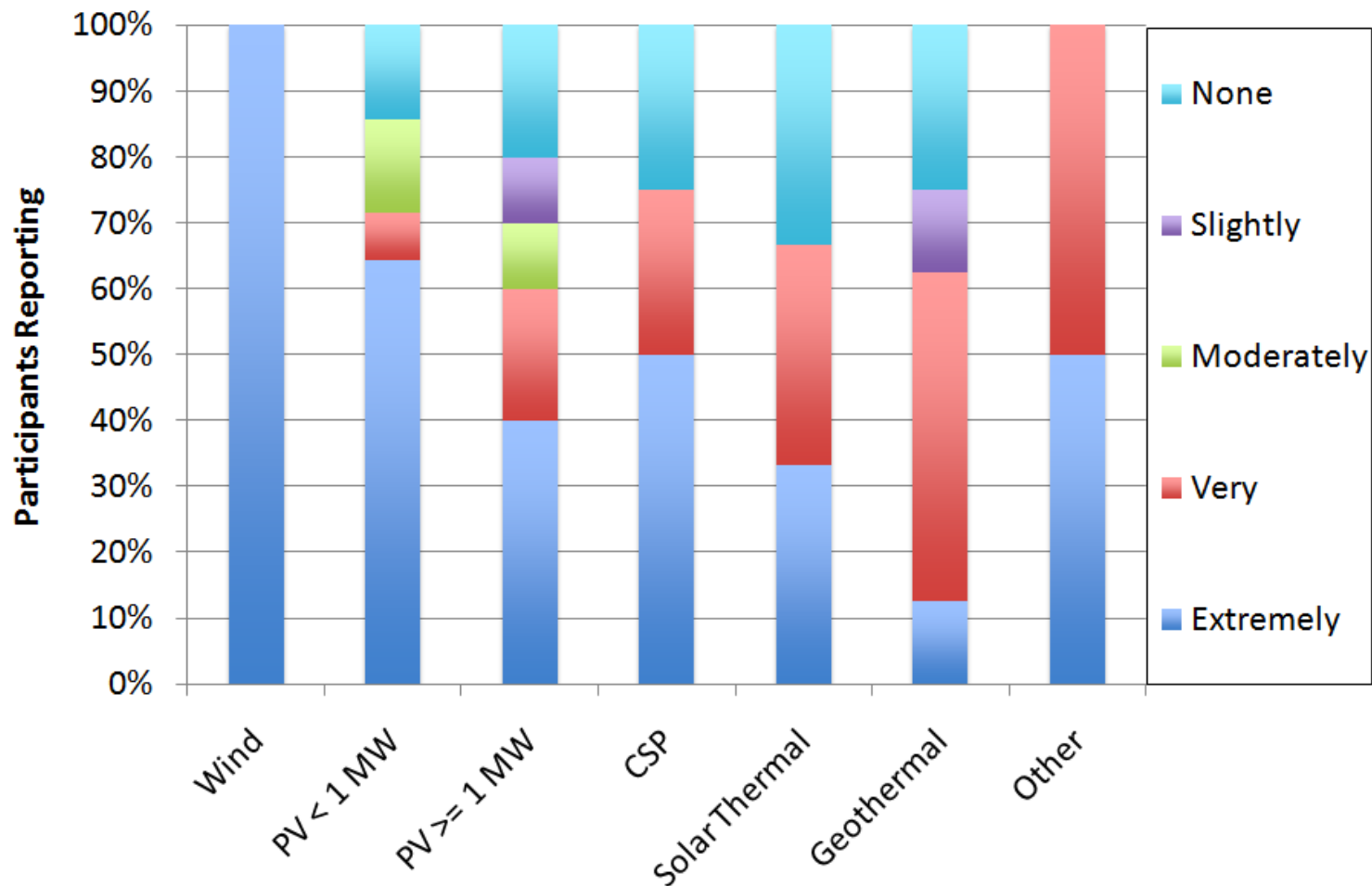


Importance of Treasury Grant: CSP

Aggregate Responses from Q4 '09 thru Q4 '10



Importance of State Incentives

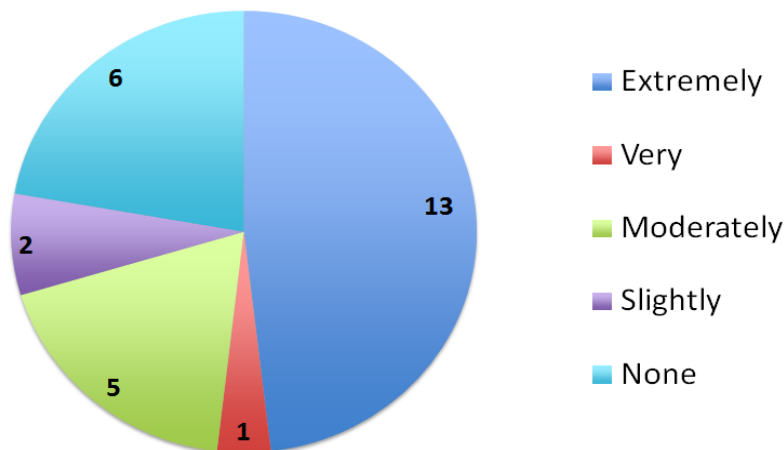


Scaled to 100%. State incentives continue to be considered extremely or very important for most REFTI respondents

Importance of State Incentives – Aggregate by Tech

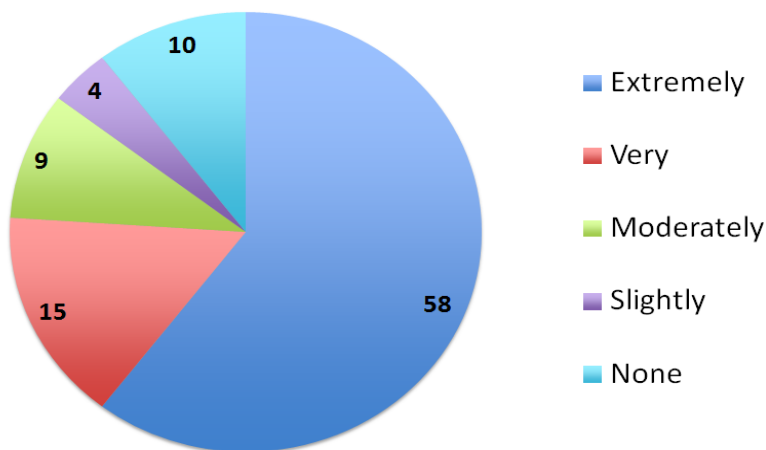
Importance of State Incentives: Wind

Aggregate Responses from Q4 '09 thru Q4 '10



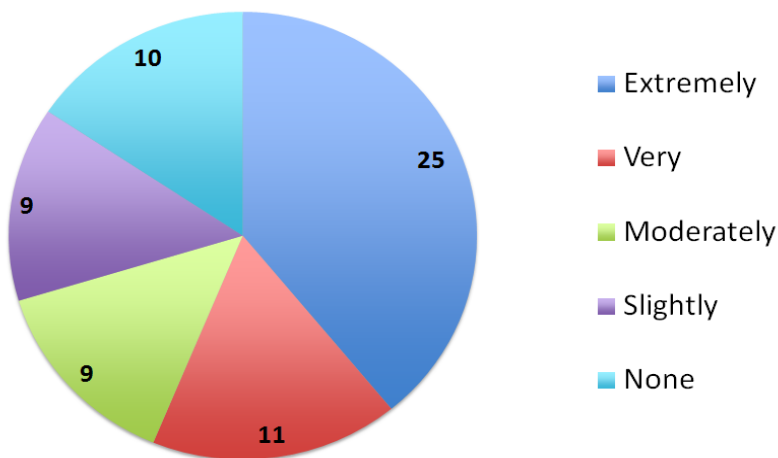
Importance of State Incentives: PV < 1MW

Aggregate Responses from Q4 '09 thru Q4 '10



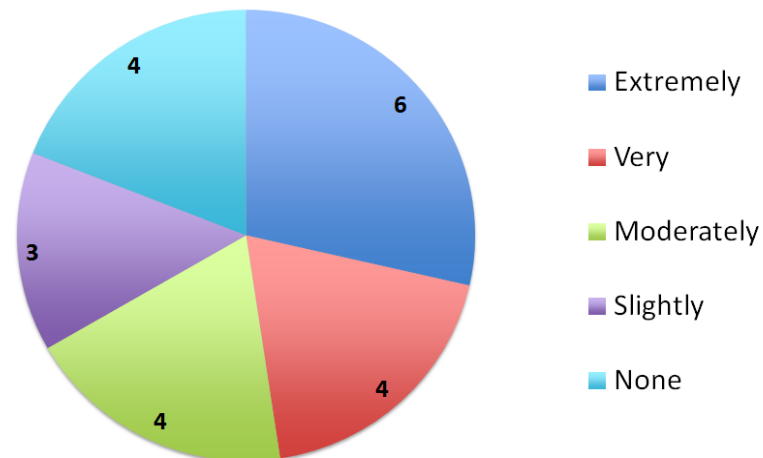
Importance of State Incentives: PV >= 1MW

Aggregate Responses from Q4 '09 thru Q4 '10

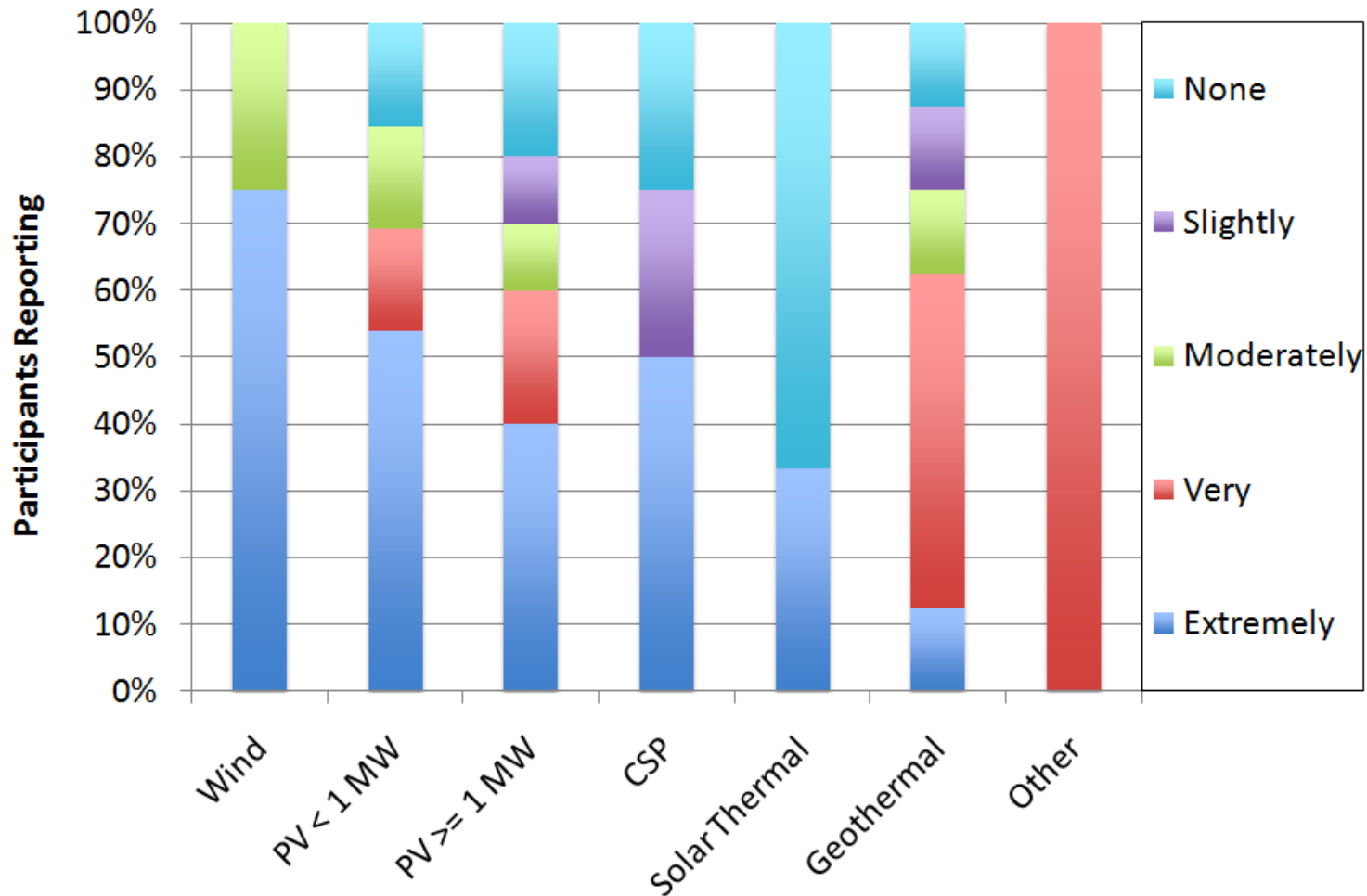


Importance of State Incentives: CSP

Aggregate Responses from Q4 '09 thru Q4 '10



Importance of Portfolio Standards



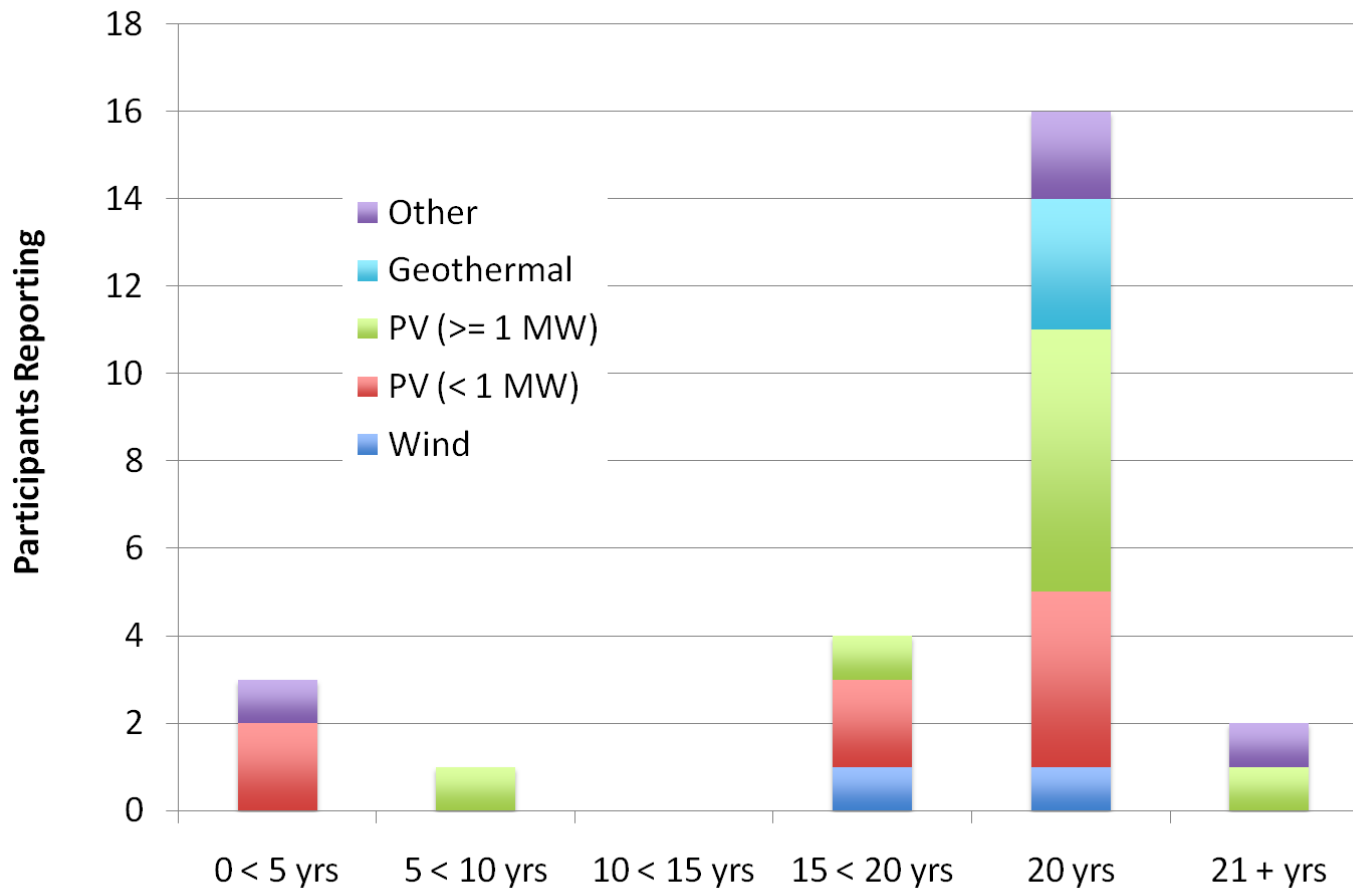
Scaled to 100%. Portfolio standards not important to solar thermal

REFTI Questionnaire: Q10

10. Please provide the following parameters to the typical Power Purchase Agreement (PPA) used in prior quarter...

	PPA Term (yrs)	Yr. 1 PPA Price (\$/kWh)	PPA Price Escalation (%)	Customer Buyout Option (yrs)
Wind	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - PV (< 1 MW)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - PV (>= 1 MW)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - CSP	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar Thermal (non-elec)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Geothermal	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Biomass - Elec	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Biomass - Non-elec	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Hydro	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Other Technologies	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Comments	<div><div></div><div></div></div>			

Typical PPA Duration

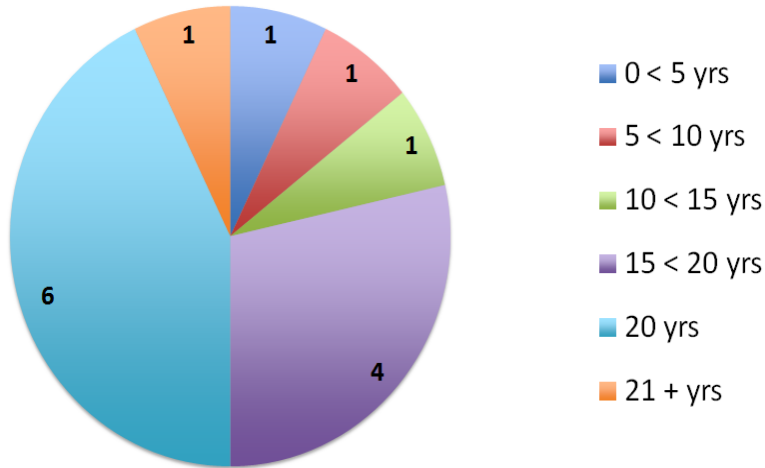


PPA duration heavily weighted towards 20 year periods

Typical PPA Duration – Aggregate Tech Breakout

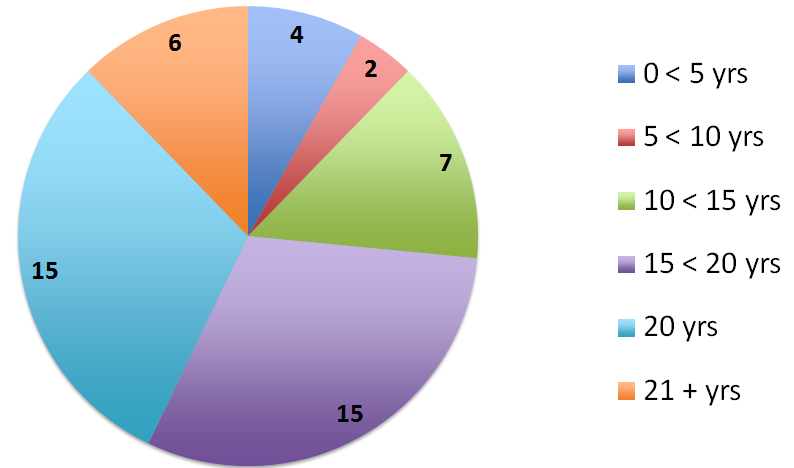
PPA Term: Wind

Aggregate Responses from Q4 '09 thru Q4 '10



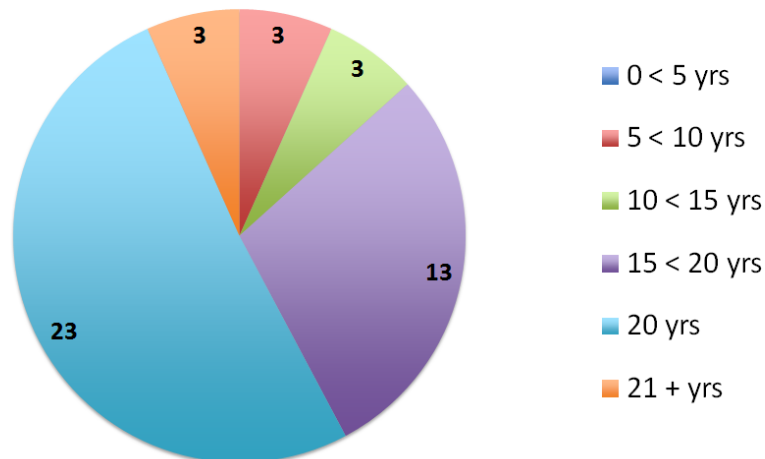
PPA Term: PV < 1MW

Aggregate Responses from Q4 '09 thru Q4 '10



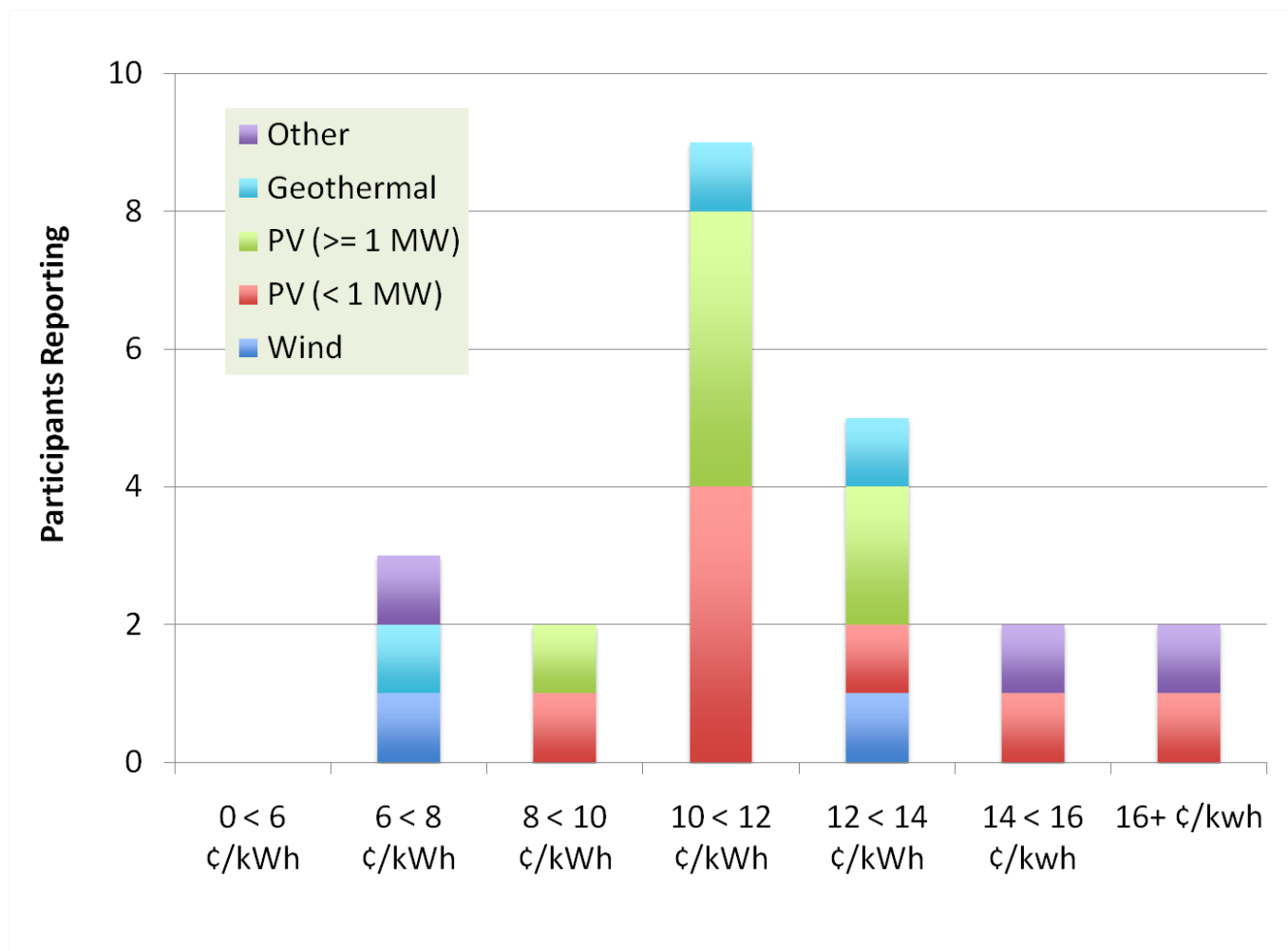
PPA Term: PV >= 1MW

Aggregate Responses from Q4 '09 thru Q4 '10



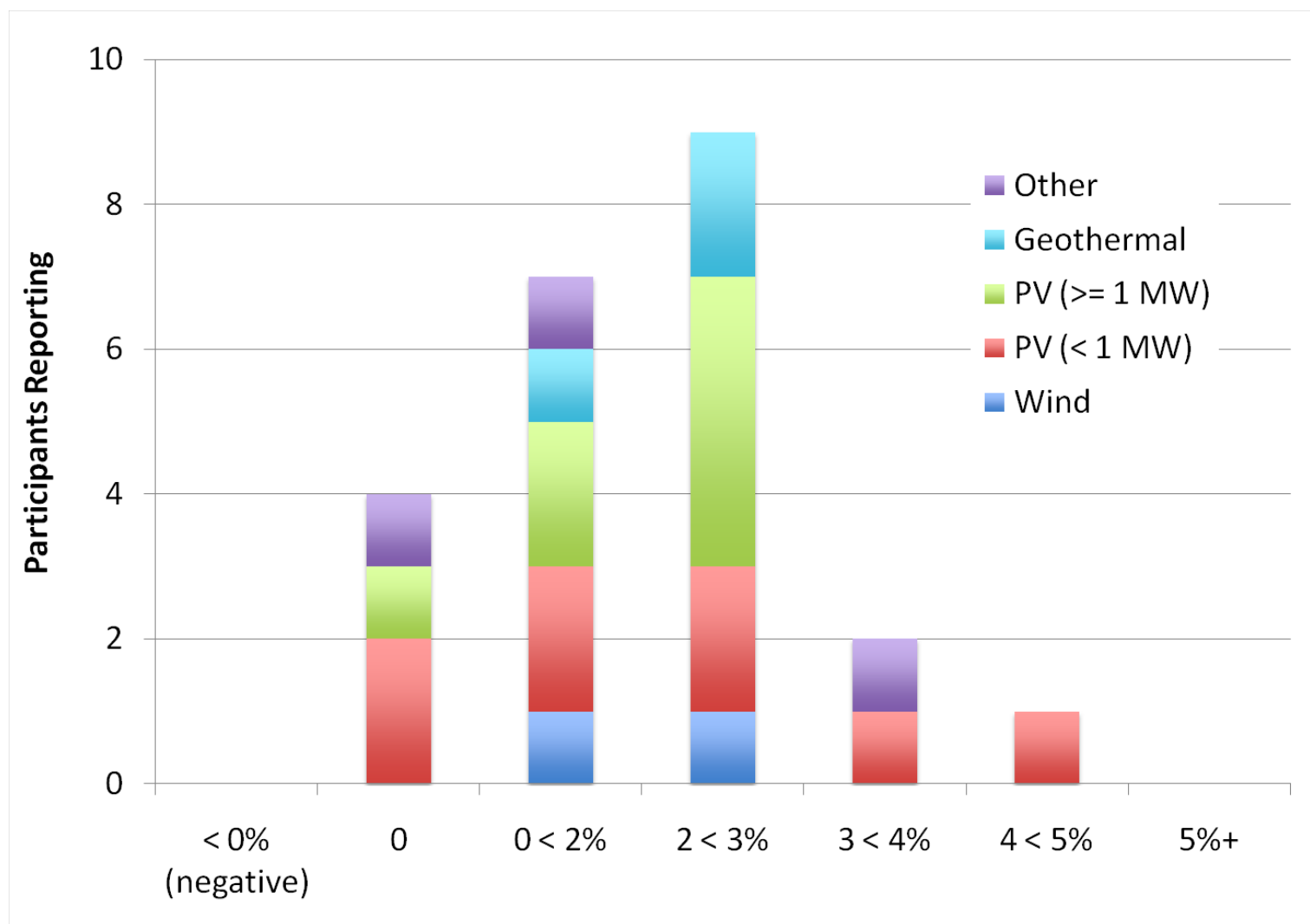
Wind and large PV most commonly with 20 year PPAs. All technologies show some very short PPAs

PPA Price - Year 1



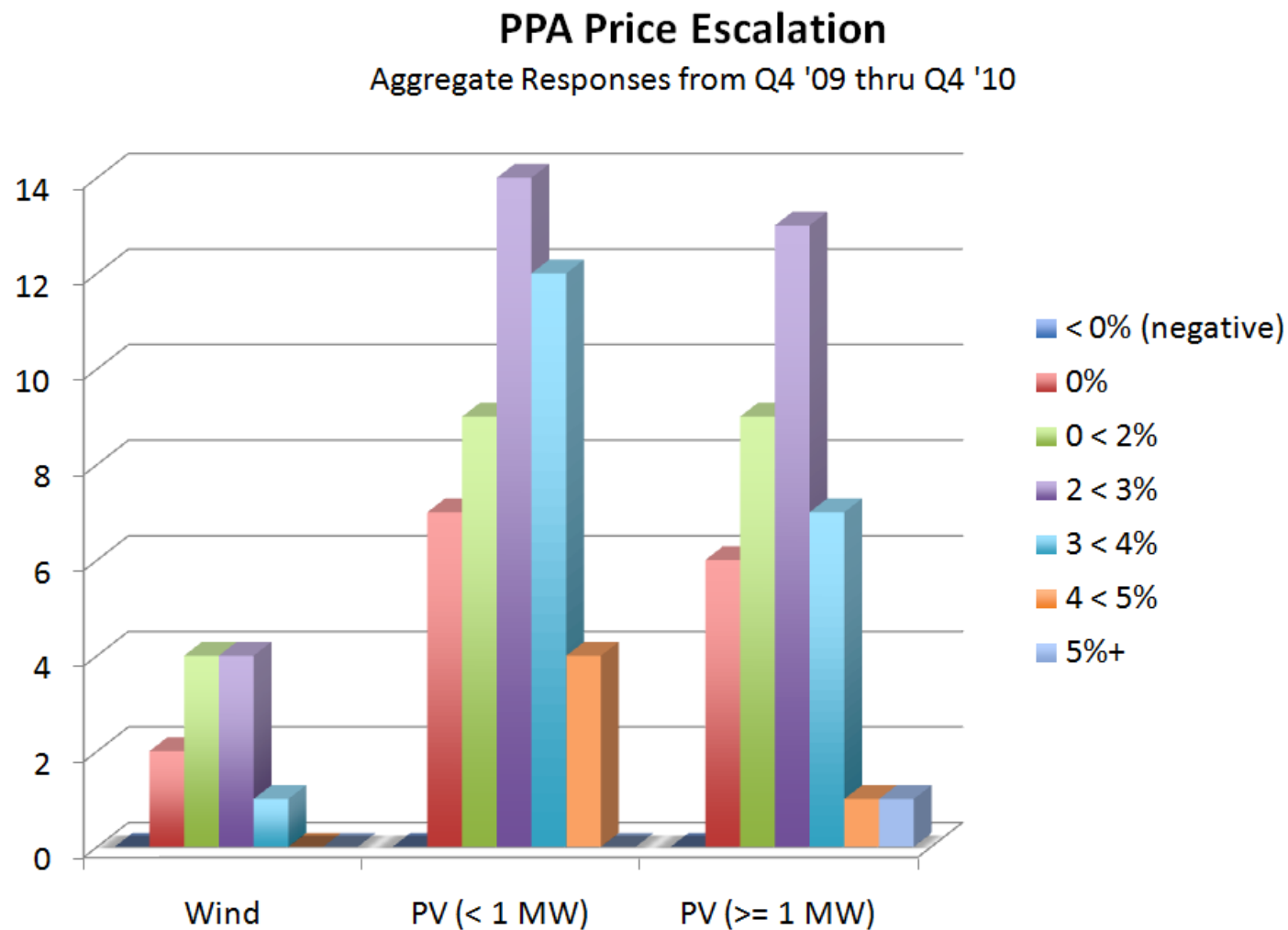
PPA prices most commonly in the 10-12 cent/kWh range. Small and large PV indicated prices < 10 cents. Values likely highly dependent on resource and state-specific incentives

PPA Price Escalation



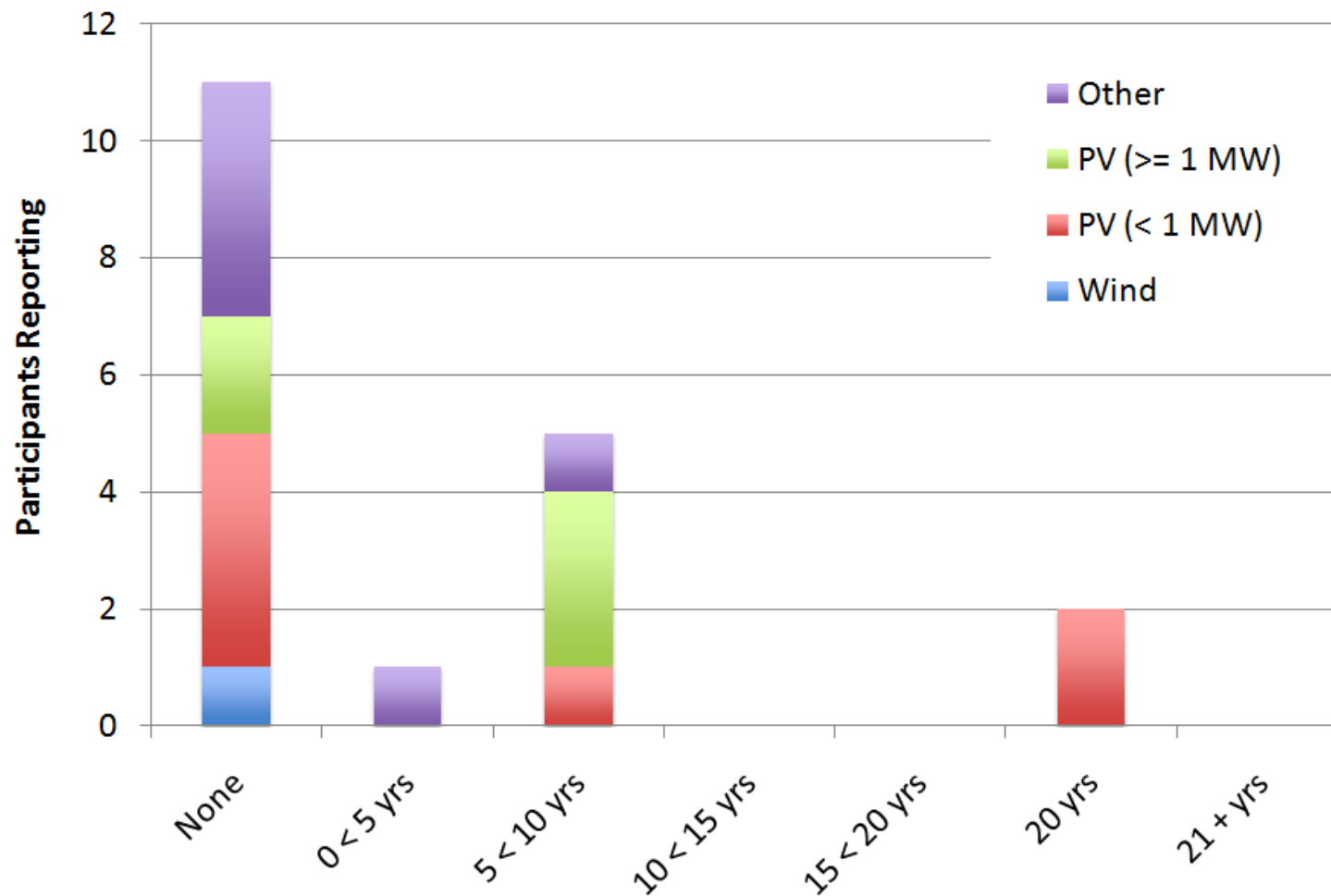
Most PPA contracts escalate at some rate, usually in 2-3% range across all technologies. 3+ % inflation becoming less common

PPA Price Escalation - Aggregate



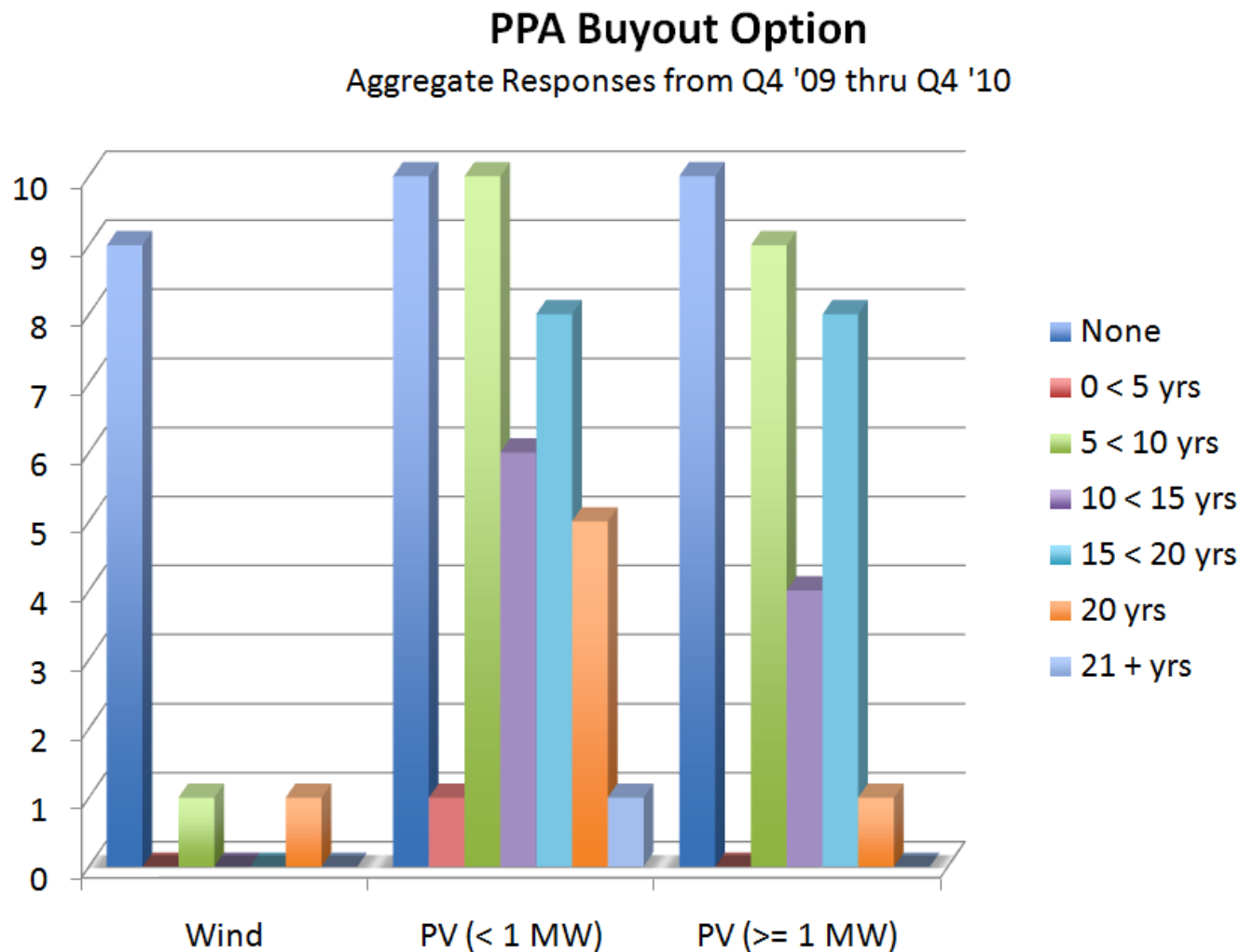
Price escalation by technology of all REFTI respondents over last 5 quarters. Y axis represents # of participants reporting

PPA Customer Buyout Option



Large number of respondents indicate no customer buyout is available, remainder say buyout most commonly in 5<10 yr range

PPA Customer Buyout Option - Aggregate



Across past 5 quarters, wind projects largely had no buyout option; small and large PV most commonly in the 5-10 year range when avail.

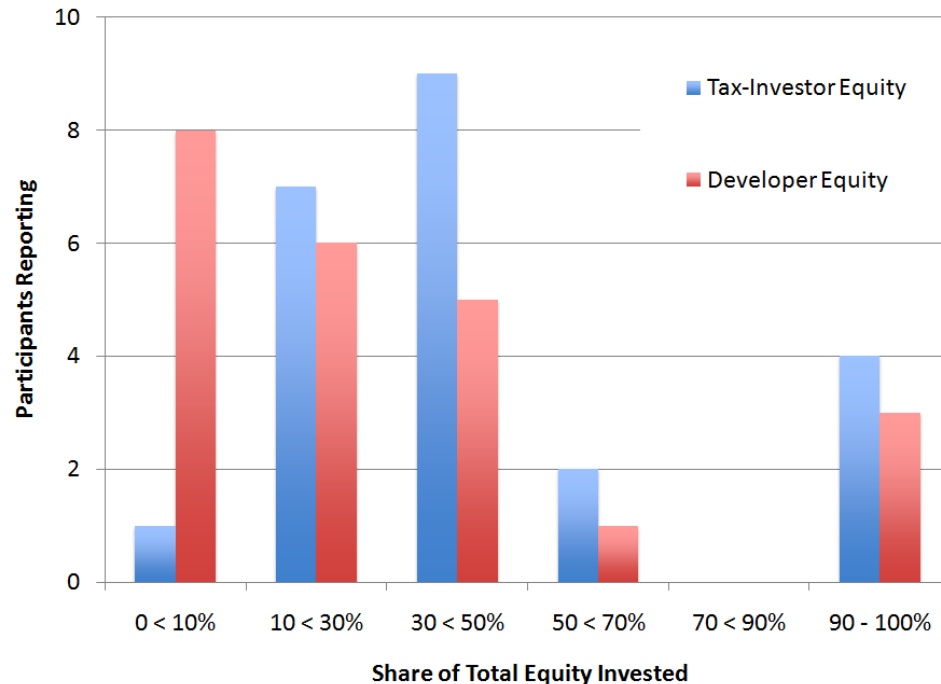
REFTI Questionnaire: Q11

11. Regarding project EQUITY CAPITAL (based on after-tax returns), please tell us how your projects are generally structured...

	Ratio of Tax-Investor Equity / Total Capital	Expected Return on Tax- Investor Equity	Ratio of Developer Equity / Total Capital	Expected Return on Developer Equity
Wind	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - PV (< 1 MW)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - PV (>= 1 MW)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - CSP	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar Thermal (non-elec)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Geothermal	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Biomass - Elec	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Biomass - Non-elec	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Hydro	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Other Technologies	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

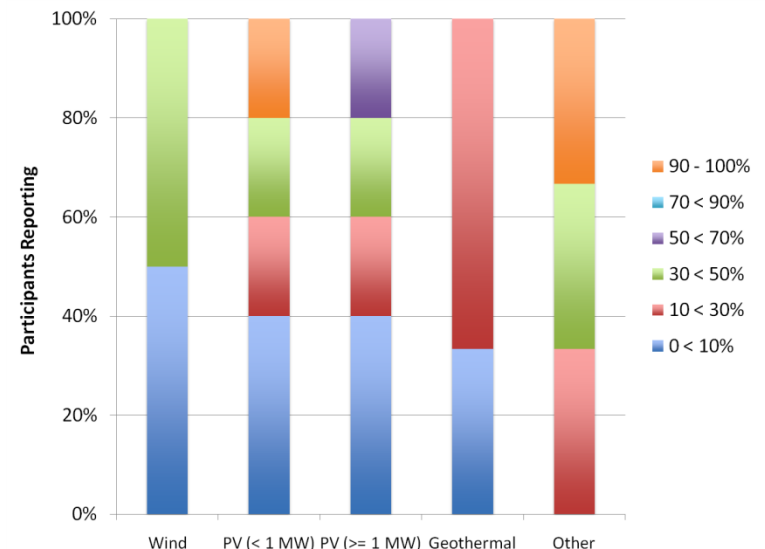
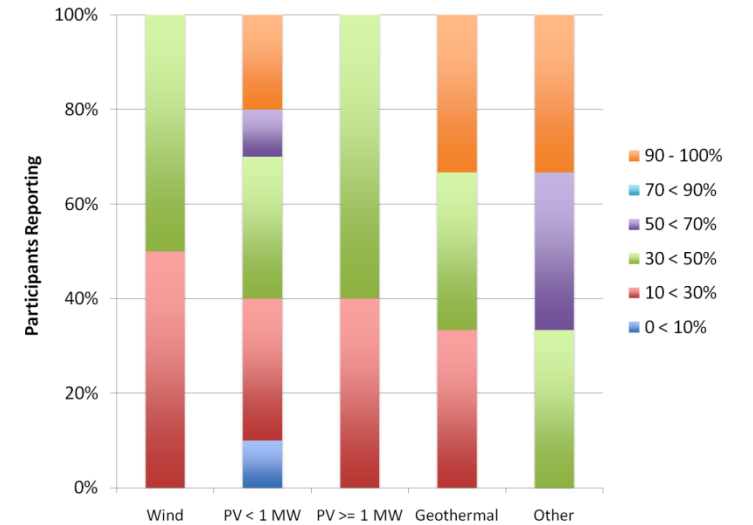
Comments

Equity Ratios – Q4 '10



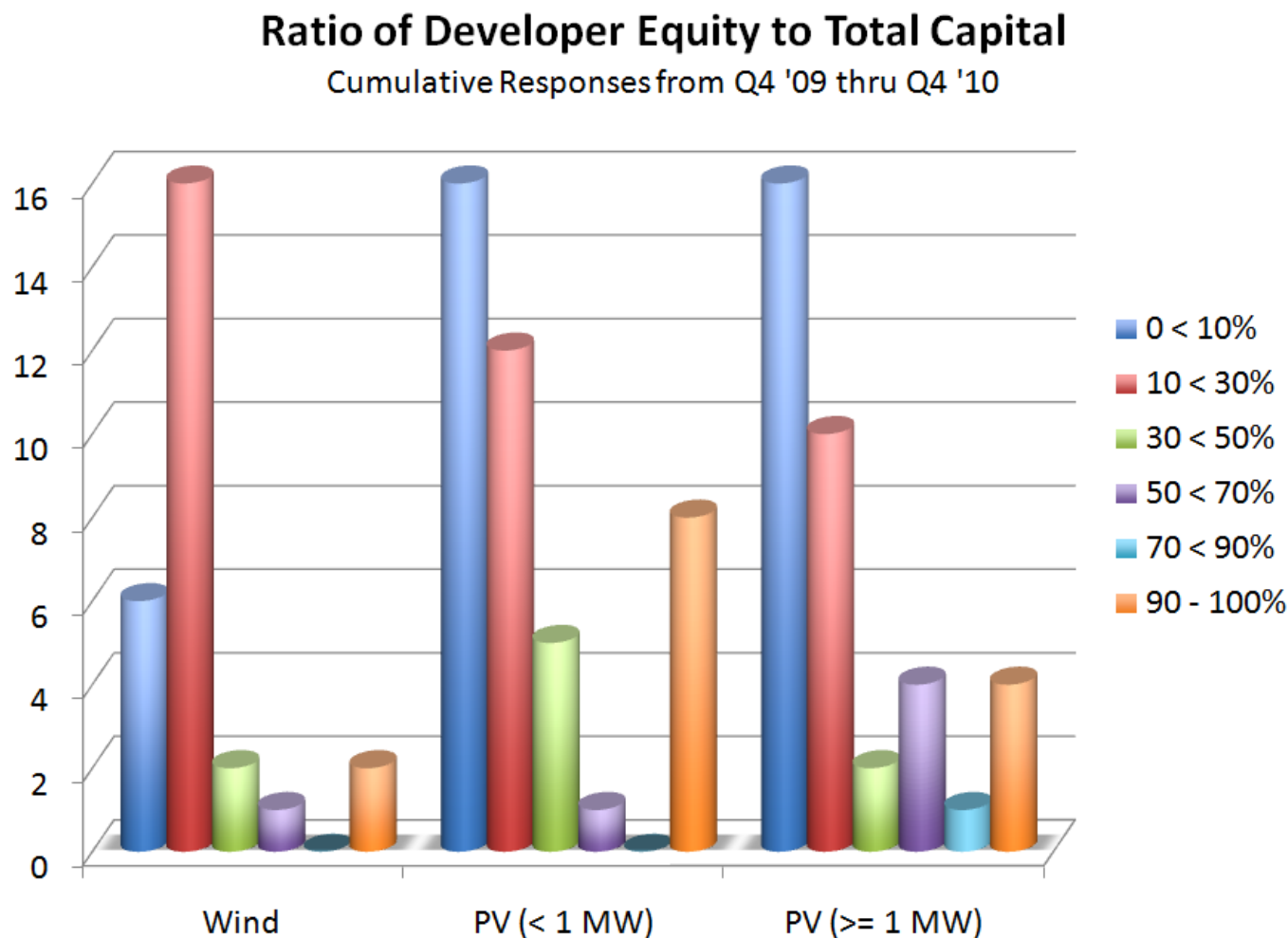
Tax and Developer equity primarily each less than 50% of total capital invested

Tax Equity



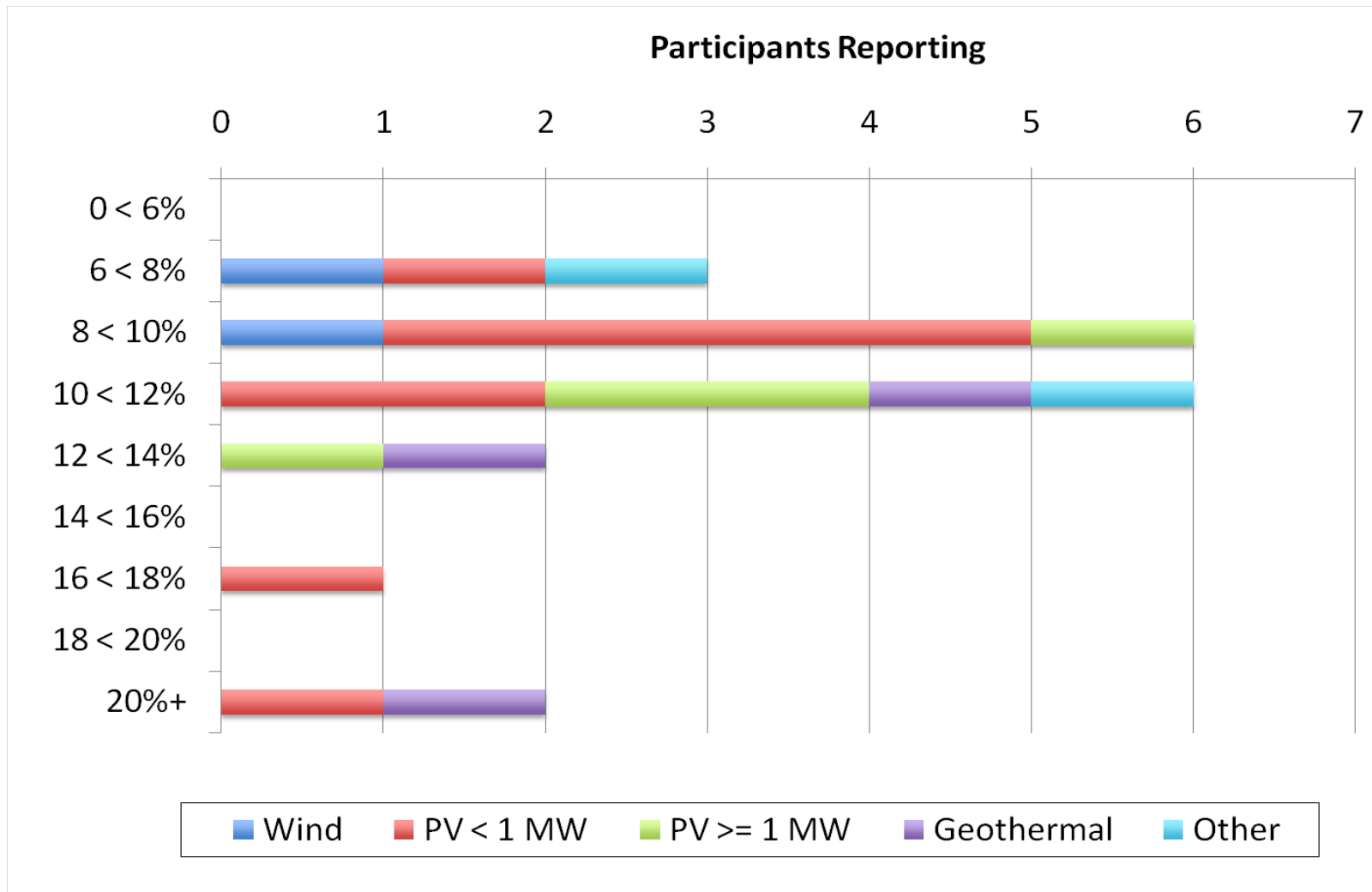
Dev. Equity

Developer Eq. to Total Capital - Aggregate



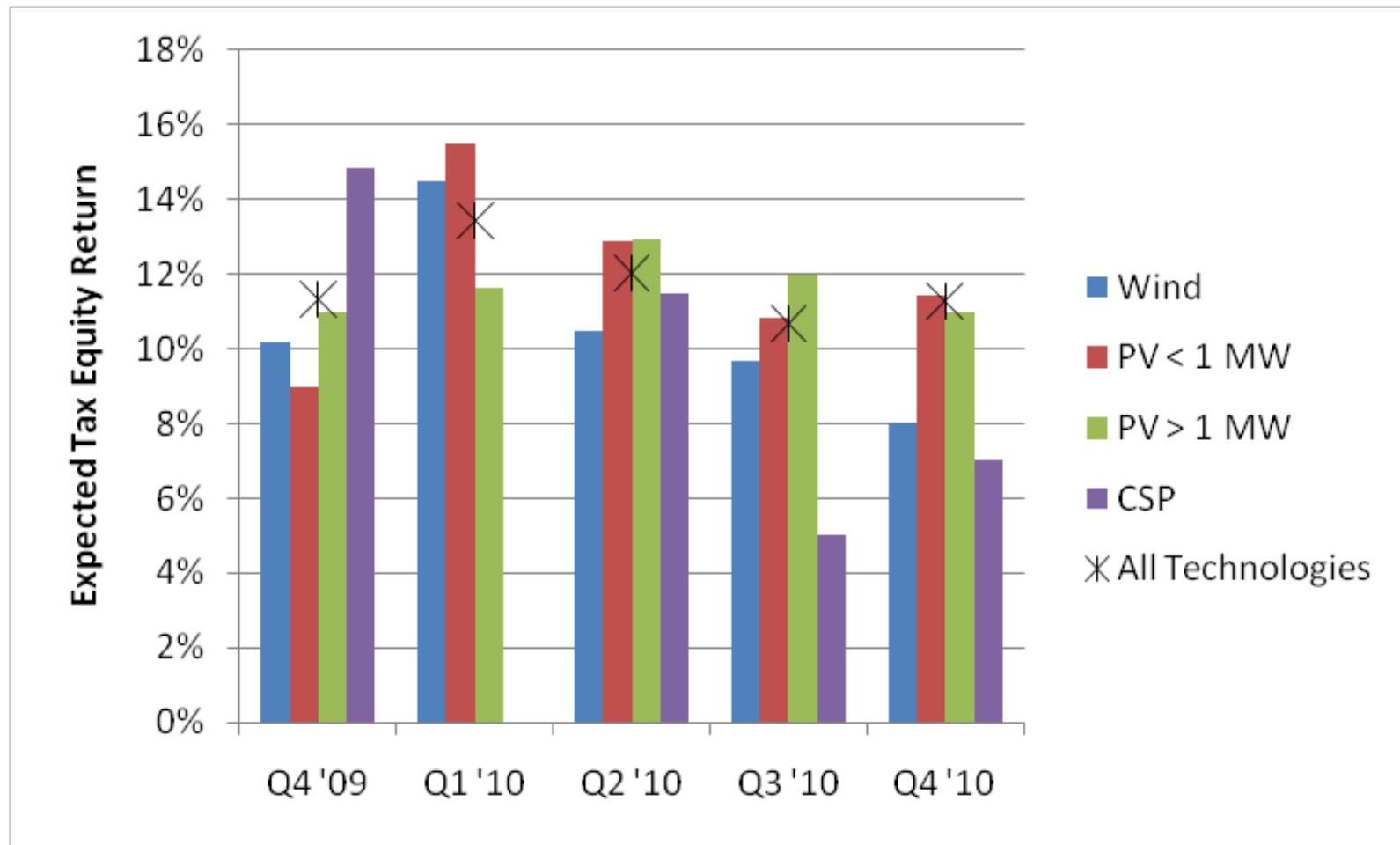
Over prior 5 quarters, developer equity primarily represented 0-10% of project capital for small and large PV, 10-30% for wind

Expected Return on Tax-Investor Equity



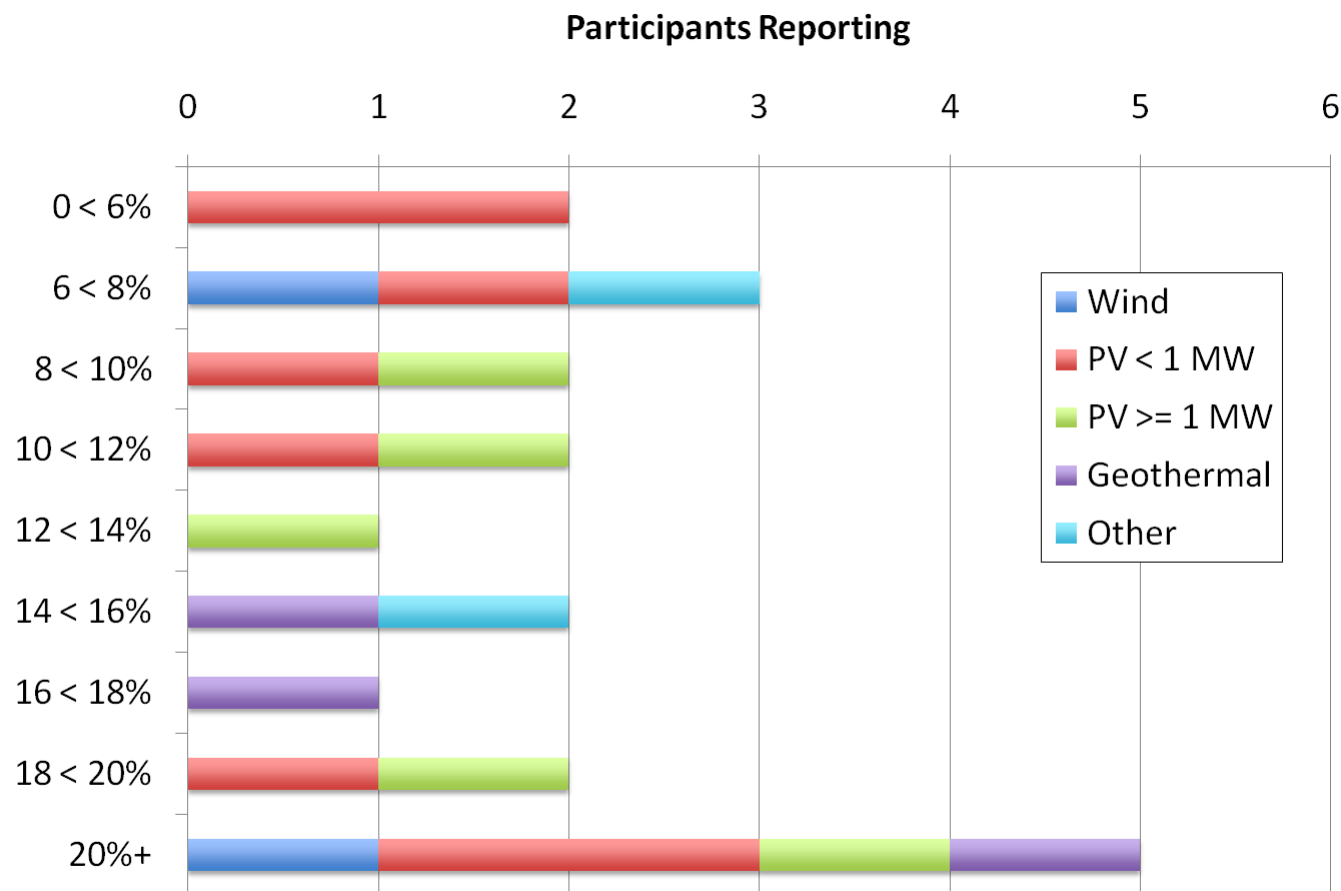
Very tight bandwidth for wind projects indicates technology maturity.
Much wider for small PV and geothermal indicates investor uncertainty

Expected Return on Tax Equity - Trend



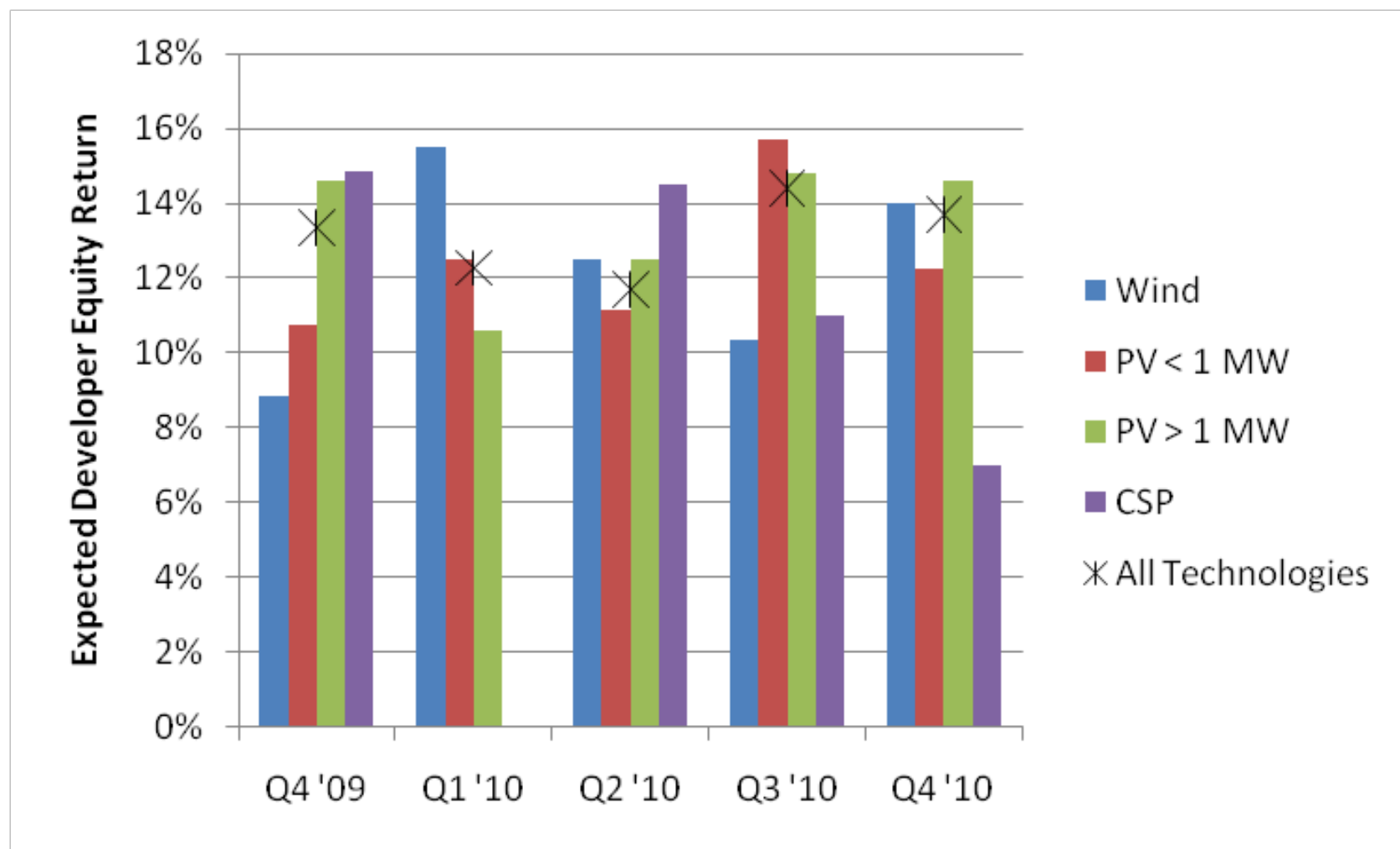
Expected tax equity yields increased after Q4 '09 but have since moderated to about 11%. Wind TE significantly less expensive than PV. CSP #s are suspect.

Expected Return on Developer Equity



Developer commonly expect returns of 20% or more (for all technologies) but also expect modest returns in many cases

Expected Return on Developer Equity



Average expected returns on developer equity generally runs in the 12-14% range. No clear trend by technology or over analysis period.

REFTI Questionnaire: Q12

12. Regarding project-level CONSTRUCTION debt, please tell us how your projects are generally structured...

	Nature of Const. Debt	Ratio of Const. Debt / Total Capital	Average All-In Cost of Const. Debt (%)	Const. Debt Term (months)
Wind	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - PV (< 1 MW)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - PV (>= 1 MW)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - CSP	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar Thermal (non-elec)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Geothermal	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Biomass - Elec	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Biomass - Non-elec	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Hydro	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Other Technologies	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Comments

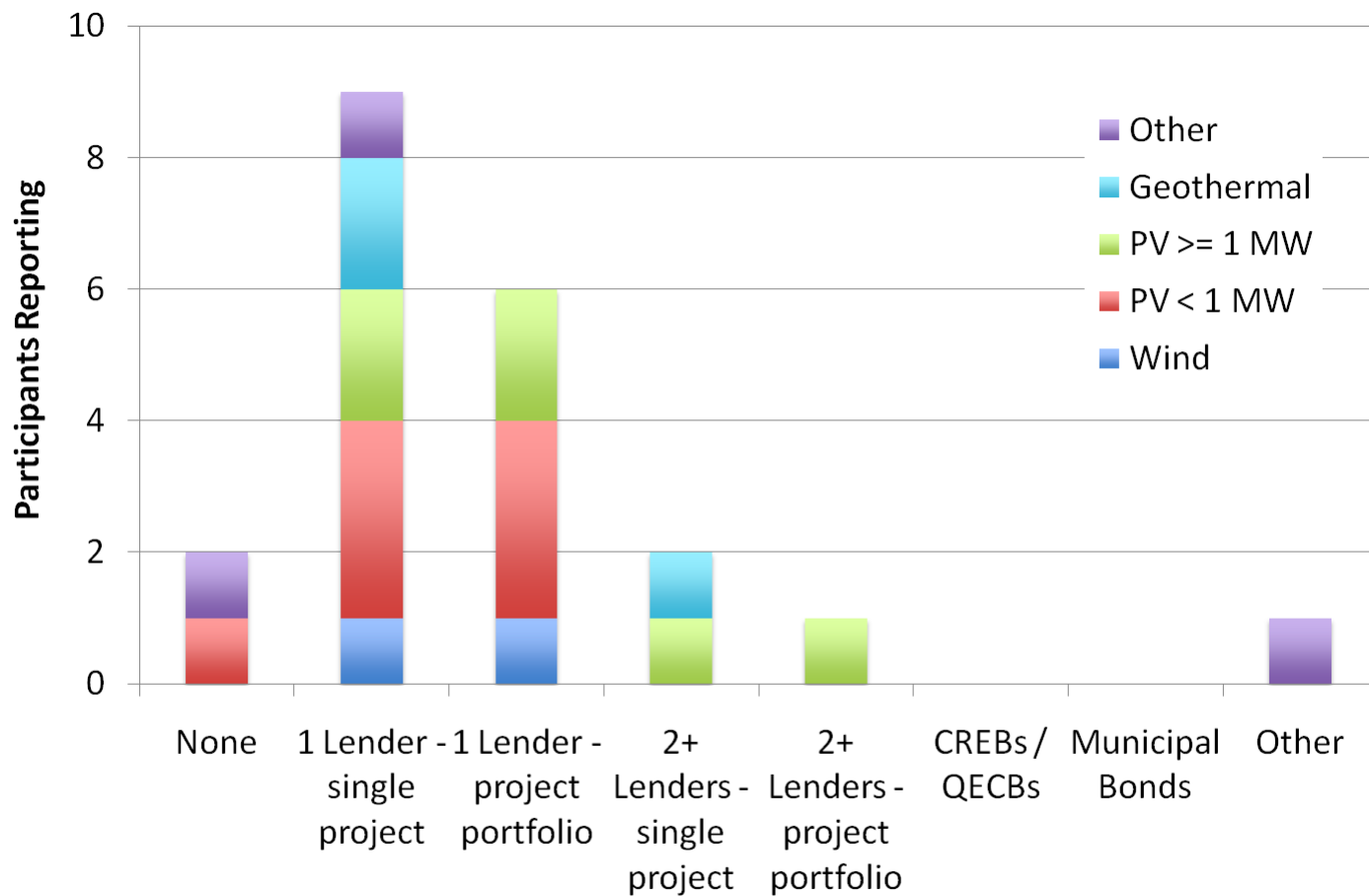
REFTI Questionnaire: Q13

13. Regarding project-level TERM debt, please tell us how your projects are generally structured...

	Source of Debt	Ratio of Debt / Total Capital	Ratio of Fed Loan Guarantee / Debt	Avg. All-In Cost of Debt (%)	Debt Term (yrs)	Avg. Debt Coverage Ratio Required
Wind	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - PV (< 1 MW)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - PV (>= 1 MW)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar - CSP	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Solar Thermal (non -elec)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Geothermal	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Biomass - Elec	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Biomass - Non-elec	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Hydro	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Other Technologies	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Comments

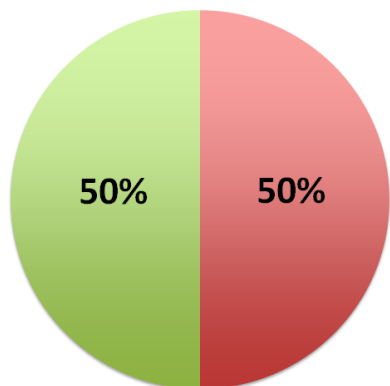
Source of Term Debt



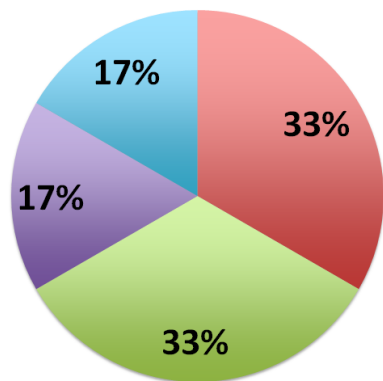
Large PV and geothermal projects referenced multi-bank “club” deals

Source of Term Debt

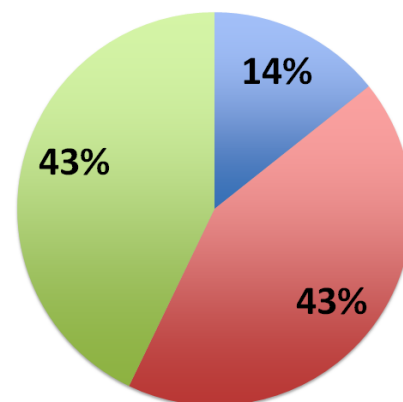
Wind



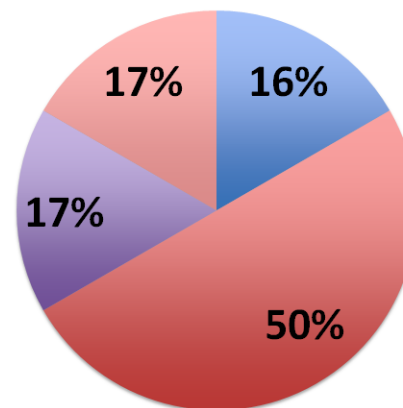
PV > 1MW



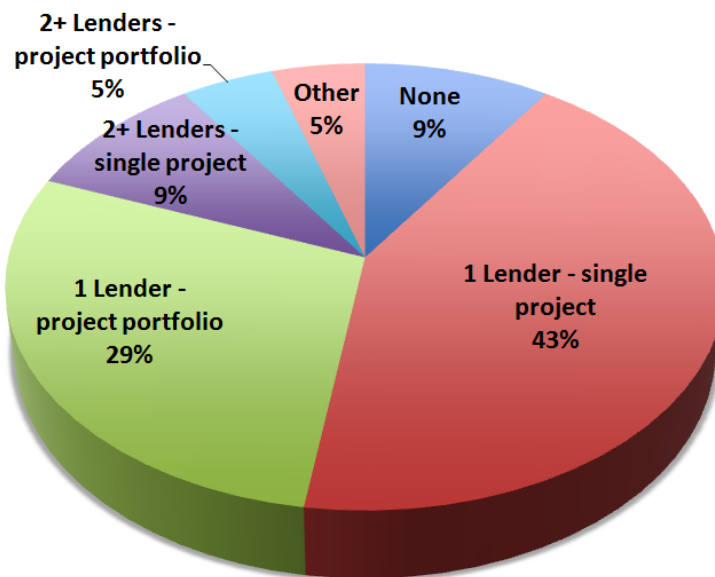
PV < 1MW



Other



All Technologies



Most commonly, REFTI projects had single lender, single project form of debt. Single lender, project portfolio also common

Term Debt as % of Total CapEx

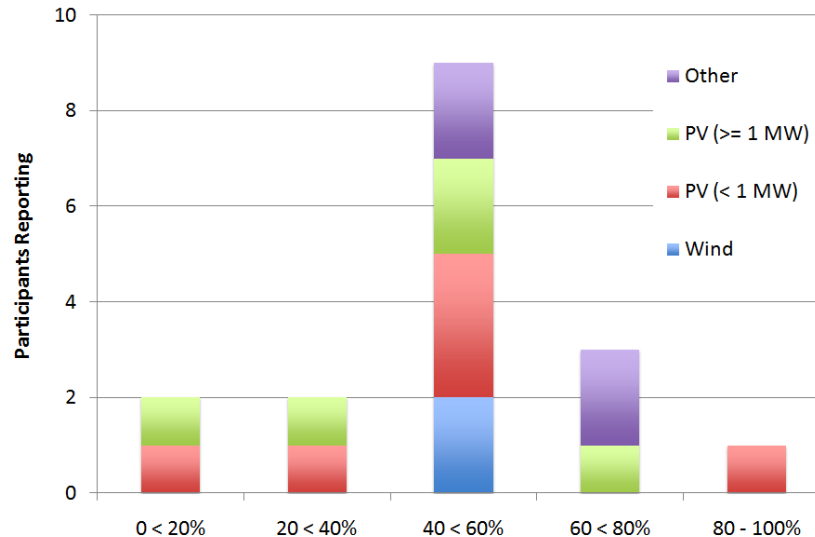
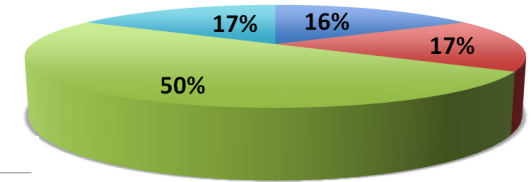
Wind

0 < 20% 20 < 40% 40 < 60% 60 < 80% 80 - 100%



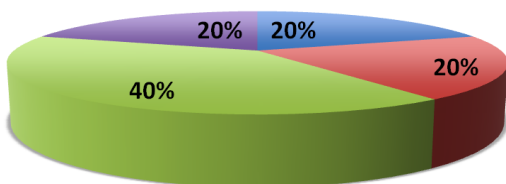
PV < 1MW

0 < 20% 20 < 40% 40 < 60% 60 < 80% 80 - 100%



PV > 1MW

0 < 20% 20 < 40% 40 < 60% 60 < 80% 80 - 100%



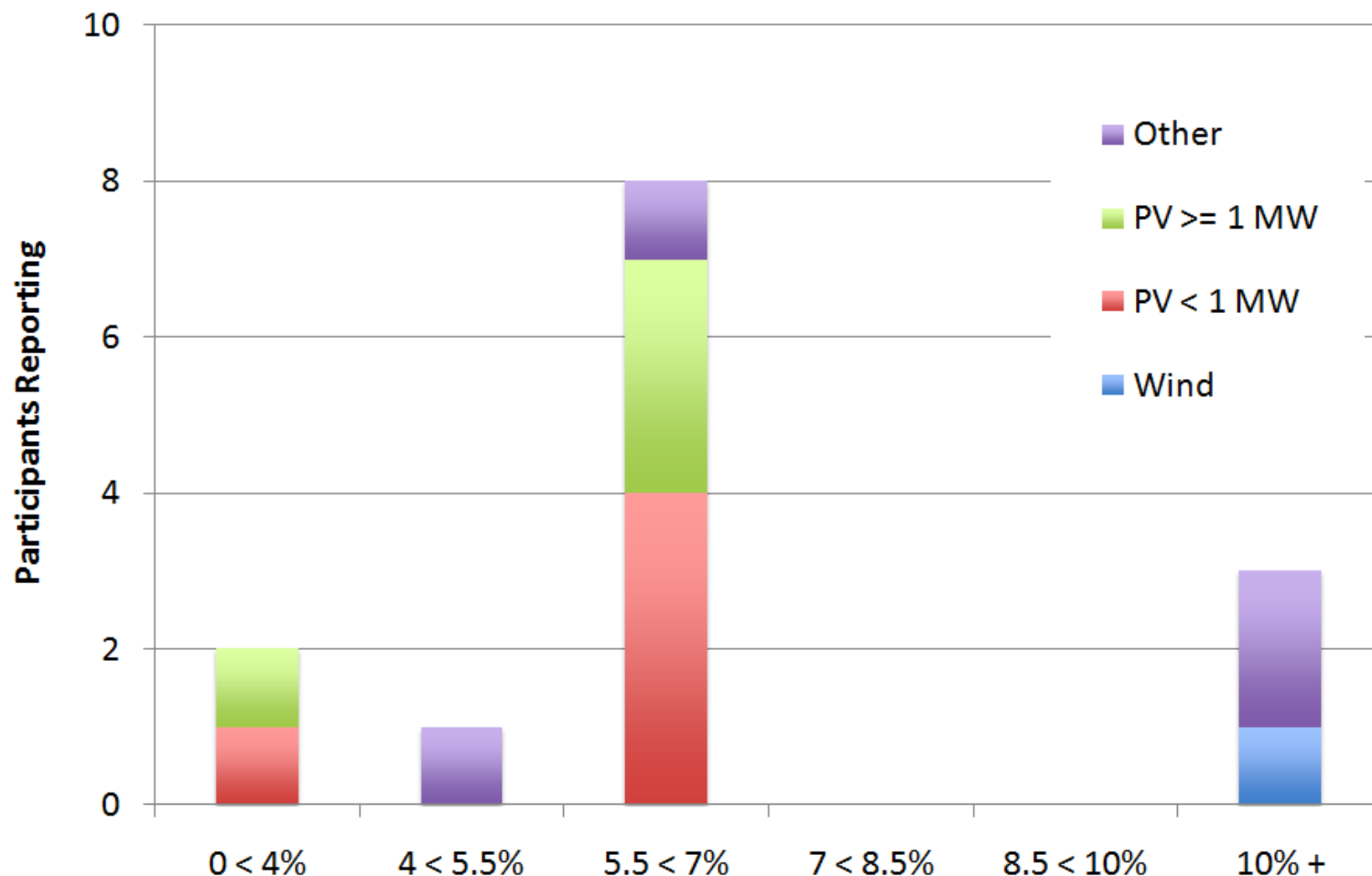
Other

0 < 20% 20 < 40% 40 < 60% 60 < 80% 80 - 100%



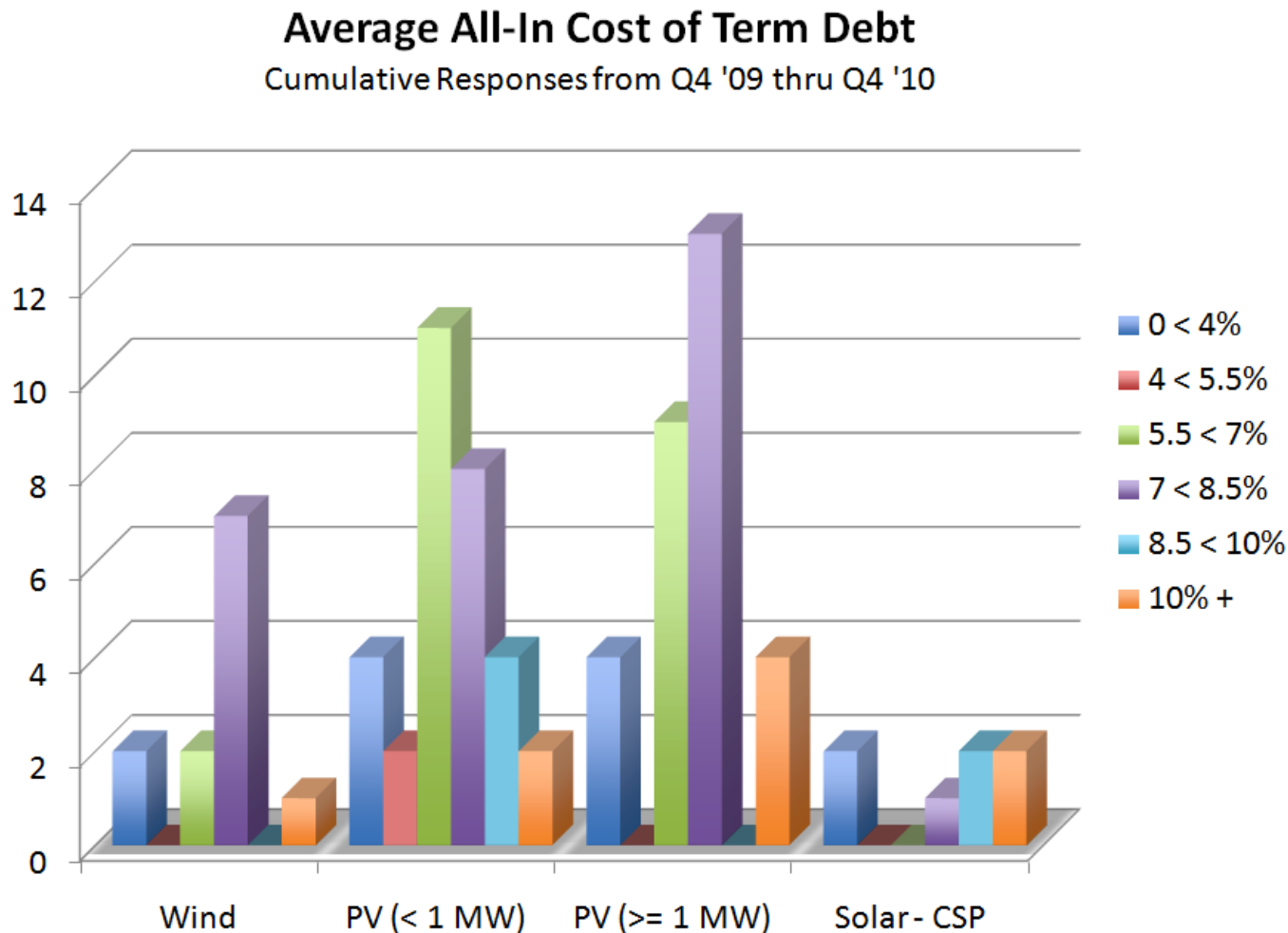
If projects had debt, it was most commonly for about half of total capitalization

Cost of Term Debt (all-in)



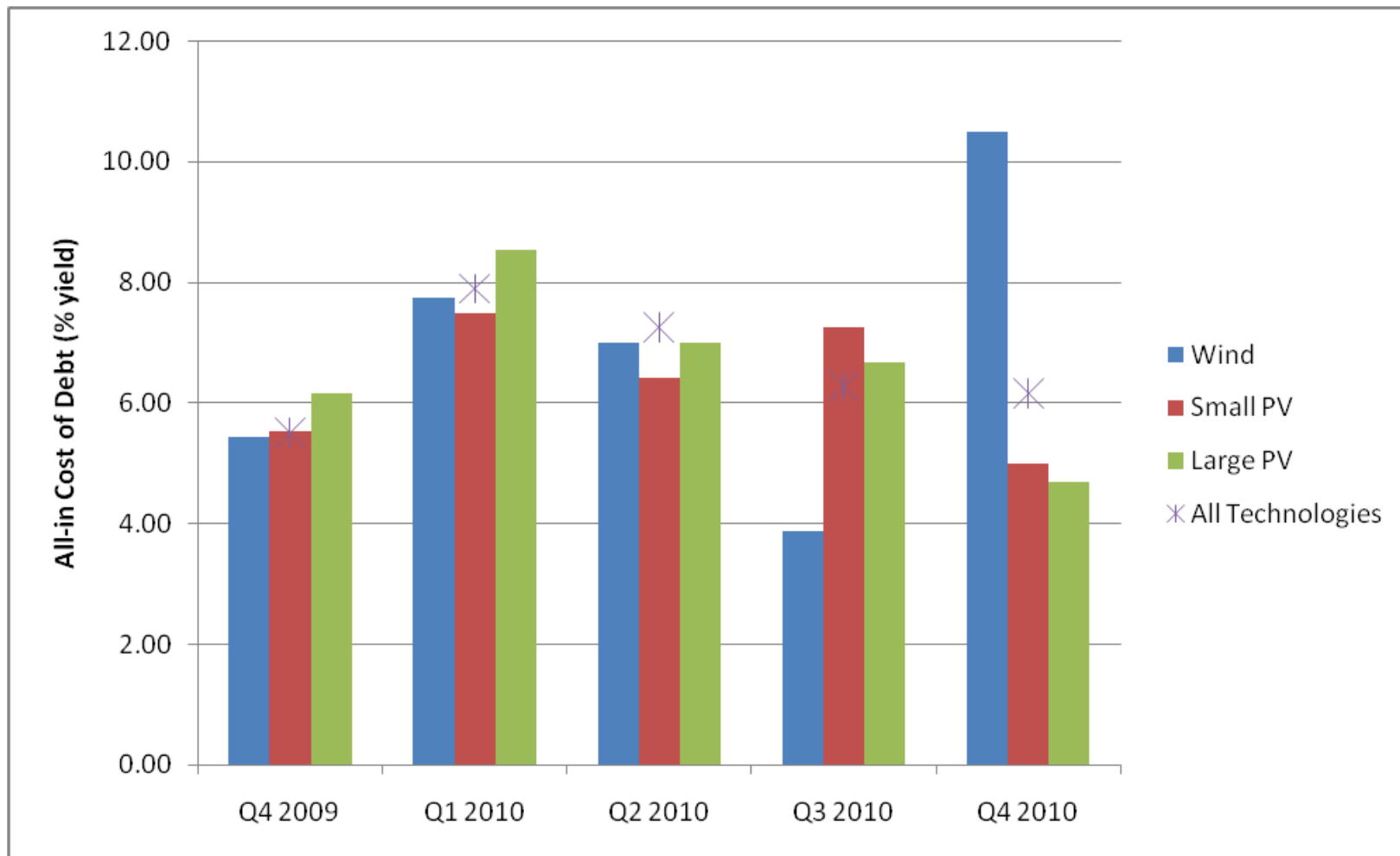
Most commonly in the 5.5% - 7.0% range in Q4 2010, but participants reporting very wide range

Cost of Term Debt (all-in) - Aggregate



Aggregate cost of debt over past 5 quarters by technology

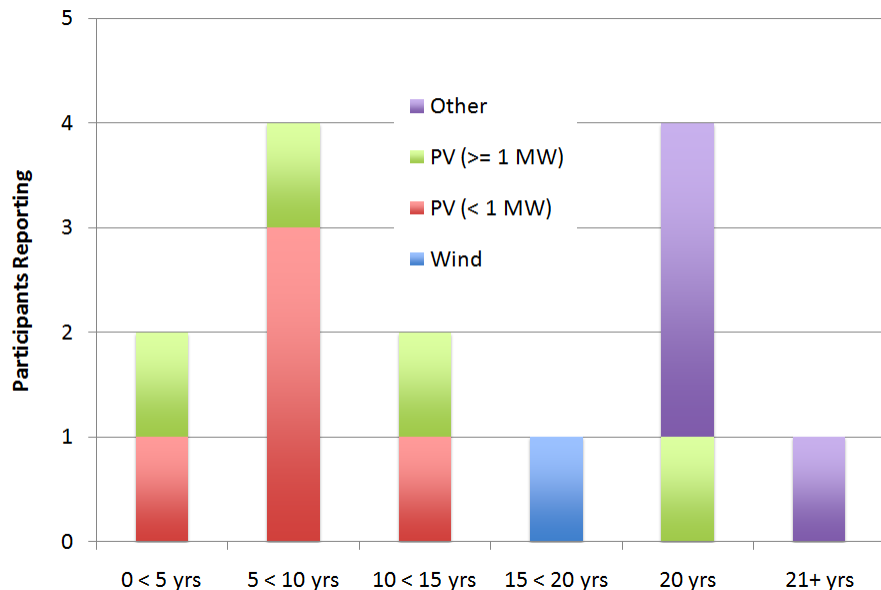
Cost of Term Debt (all-in) – Trend Analysis



High variability in debt rates referenced for wind projects. All technologies' cost of debt declining since Q1 2010

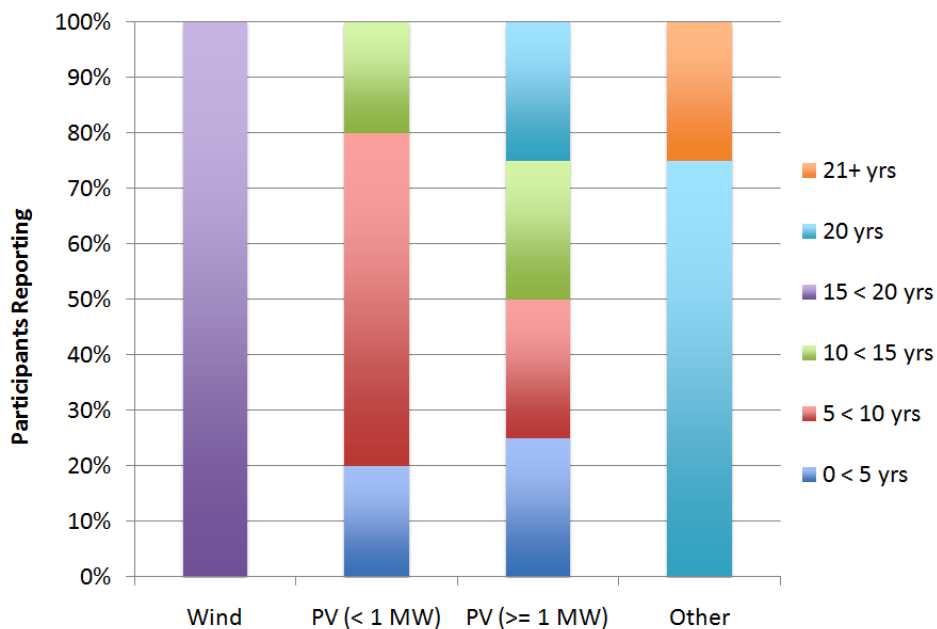
Term Debt Duration

by bin range

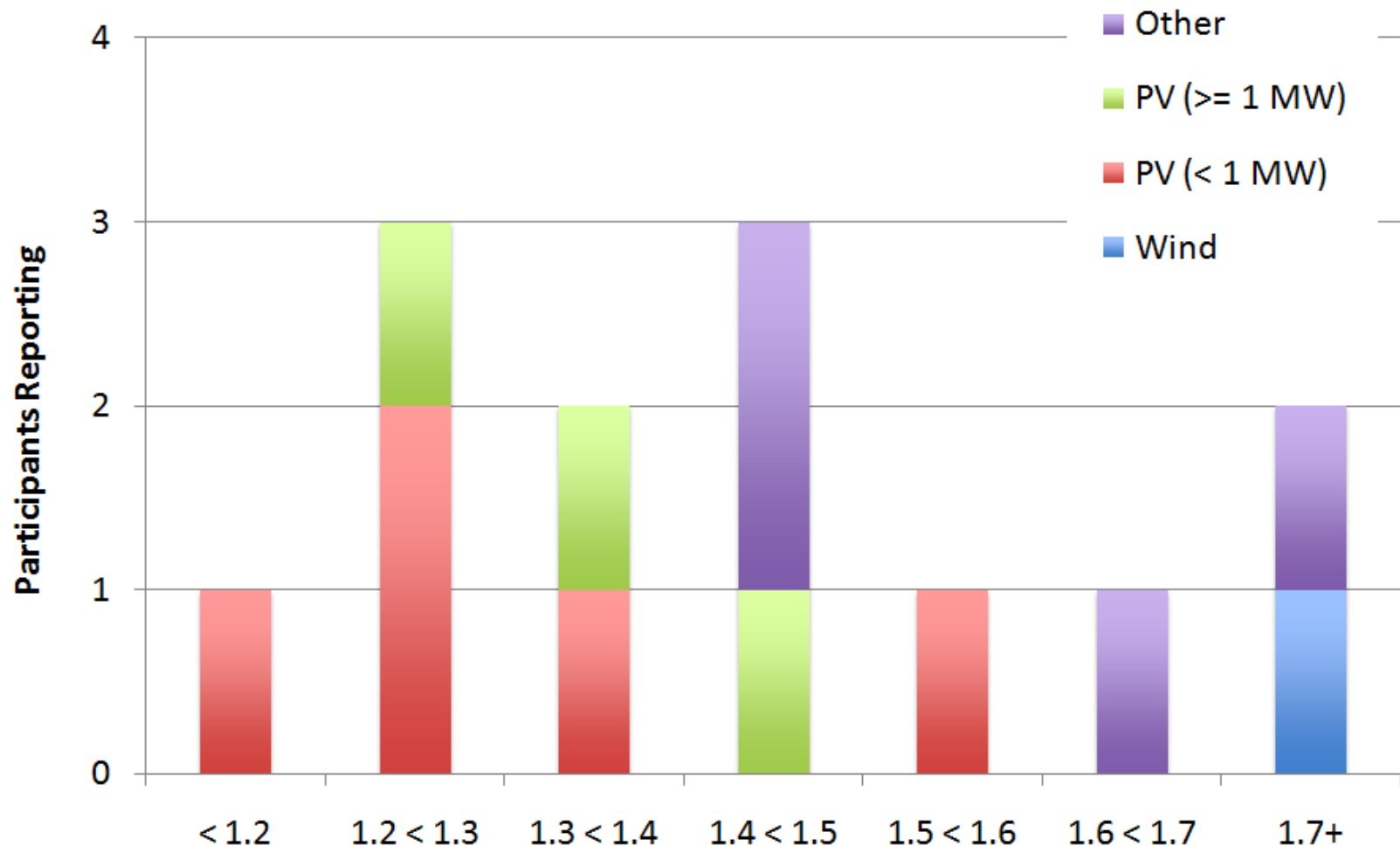


Small PV most commonly around 5-10 years, all under 15 years. 20+ year debt for all other technologies including geothermal and solar CSP

by technology, scaled to 100%



Debt Service Coverage Ratios Required



Min debt coverage ratios most commonly in the 1.2 – 1.3x range for small PV, in the 1.4 – 1.5x range for other technologies

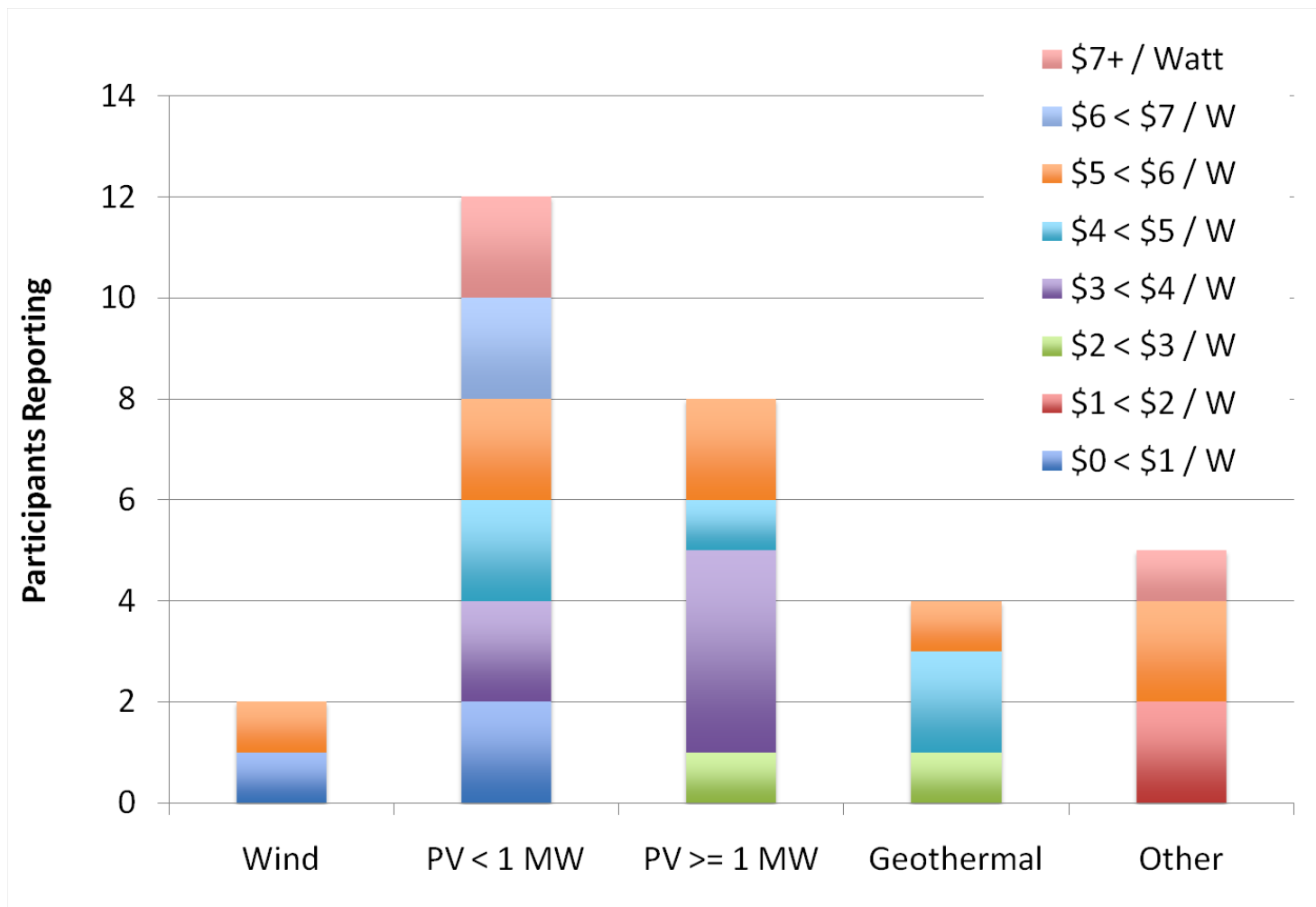
REFTI Questionnaire: Q14

14. Provide the average INSTALLED COSTS (before incentives) and LEVELIZED COST OF ENERGY (LCOE) (after incentives) from your projects

(LCOE is generally the present value of costs divided by the present value of energy delivered)

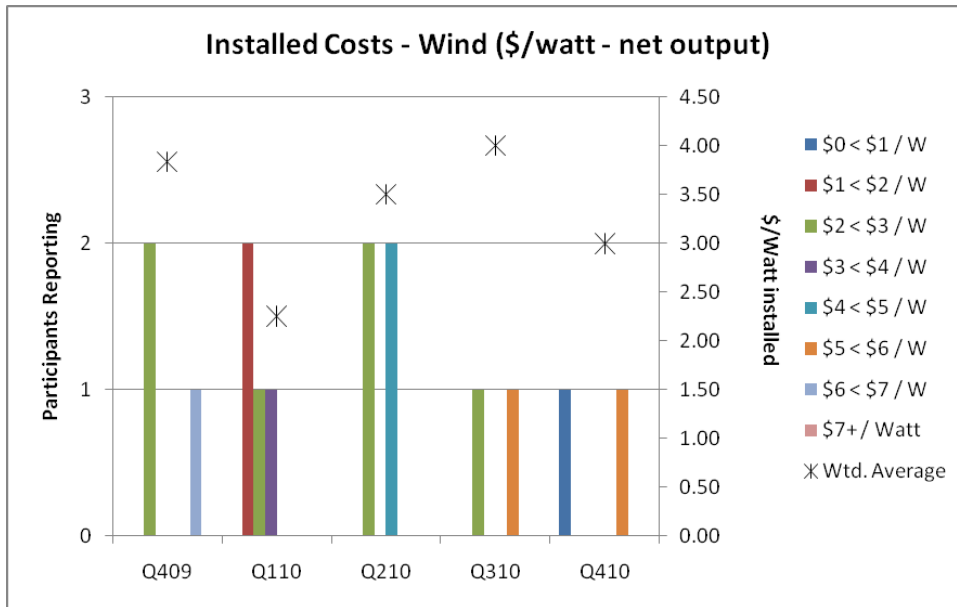
	Installed Costs (\$ / Watt - net output)	LCOE (¢/kWh)
Wind	<input type="text"/>	<input type="text"/>
Solar - PV (< 1 MW)	<input type="text"/>	<input type="text"/>
Solar - PV (>= 1 MW)	<input type="text"/>	<input type="text"/>
Solar - CSP	<input type="text"/>	<input type="text"/>
Solar Thermal (non-elec)	<input type="text"/>	<input type="text"/>
Geothermal	<input type="text"/>	<input type="text"/>
Biomass - Elec	<input type="text"/>	<input type="text"/>
Biomass - Non-elec	<input type="text"/>	<input type="text"/>
Hydro	<input type="text"/>	<input type="text"/>
Other Technologies	<input type="text"/>	<input type="text"/>
Comments	<input type="text"/>	

Installed Costs (before incentives)

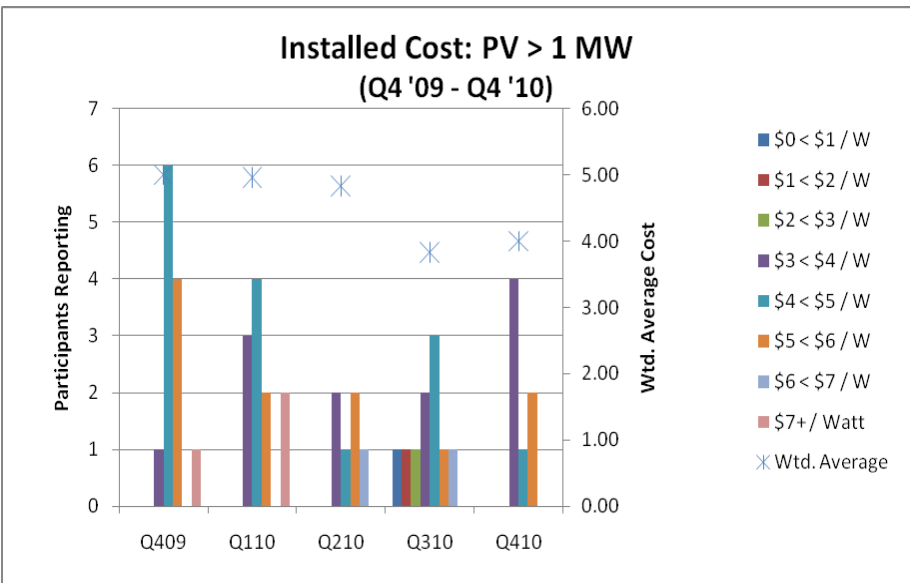
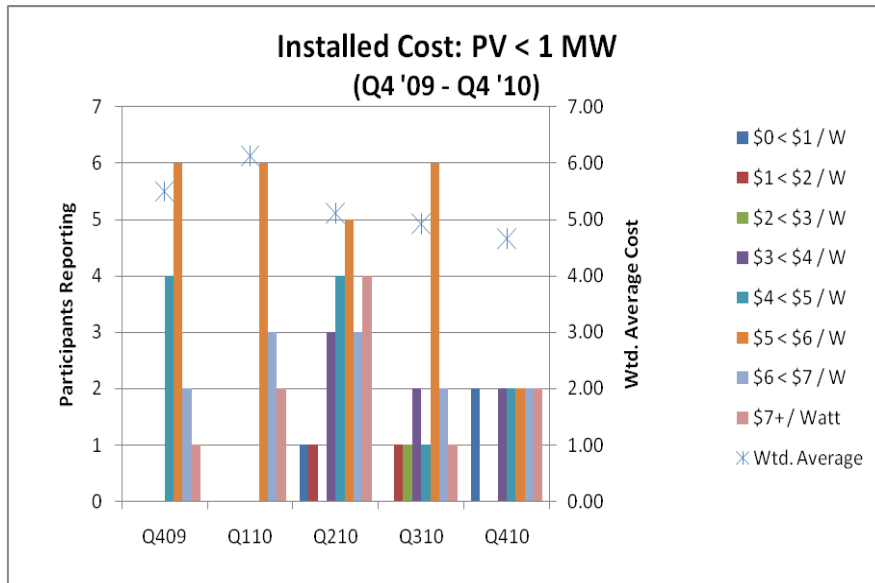


Very wide range for small PV reported, large PV most commonly in the \$3-\$4 range

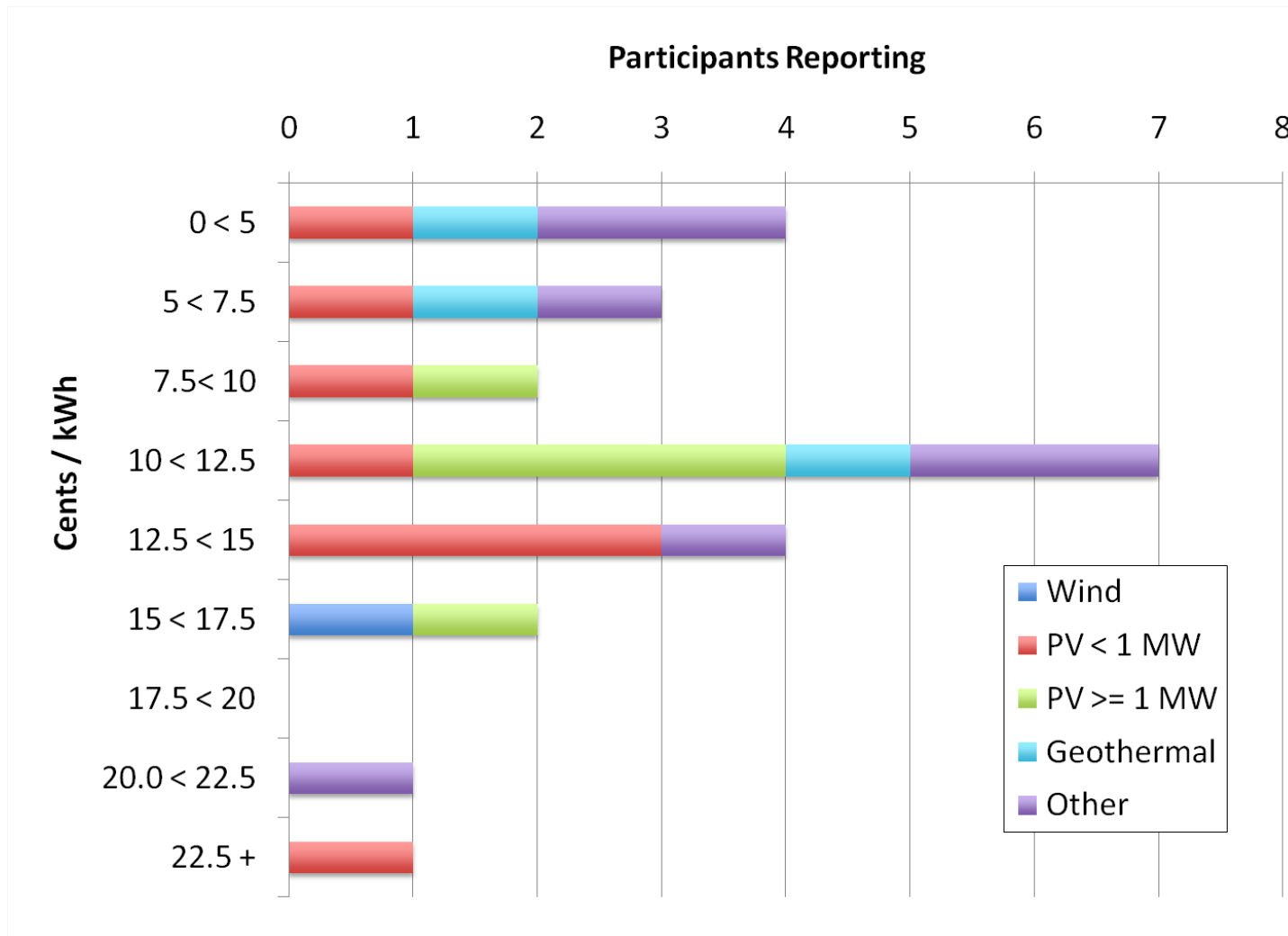
Installed Costs –Trend Analysis



Installed costs for wind shows no pattern, higher than expected values. Small and large PV show declines over prior 5 quarters to just under \$5 and \$4, respectively



Levelized Cost of Energy (cents/kWh)

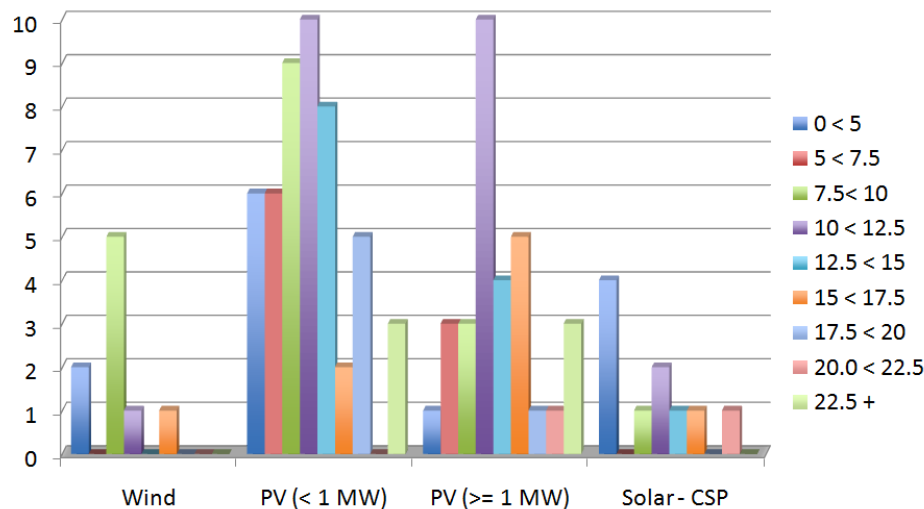


RE projects most commonly reporting LCOE's in the 10.0 - 12.5 cents/kWh range (after incentives).

LCOE – Aggregate & Trend Results

Levelized Costs of Energy (cents/kWh)

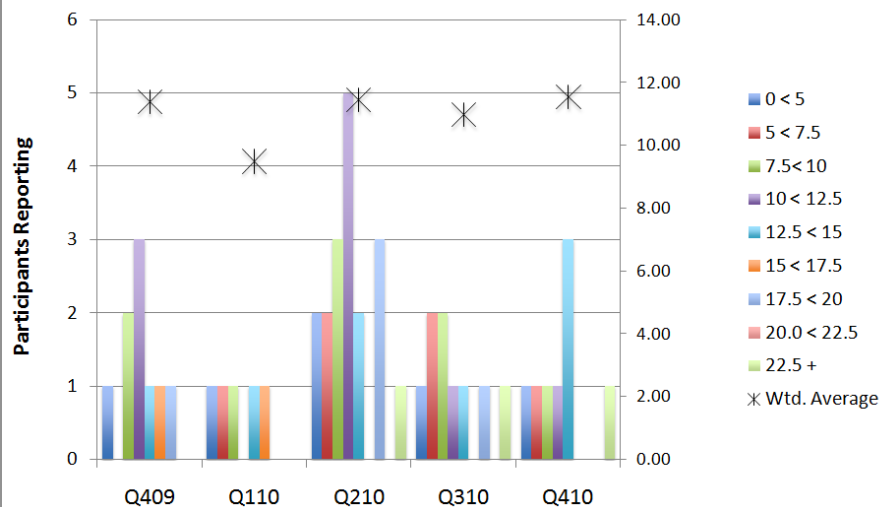
Cumulative Responses from Q4 '09 thru Q4 '10



Top figure – aggregate LCOE. Bottom figures – trend for small and large PV with weighted averages. LCOEs for large PV appear to be declining; small PV trend is increasing

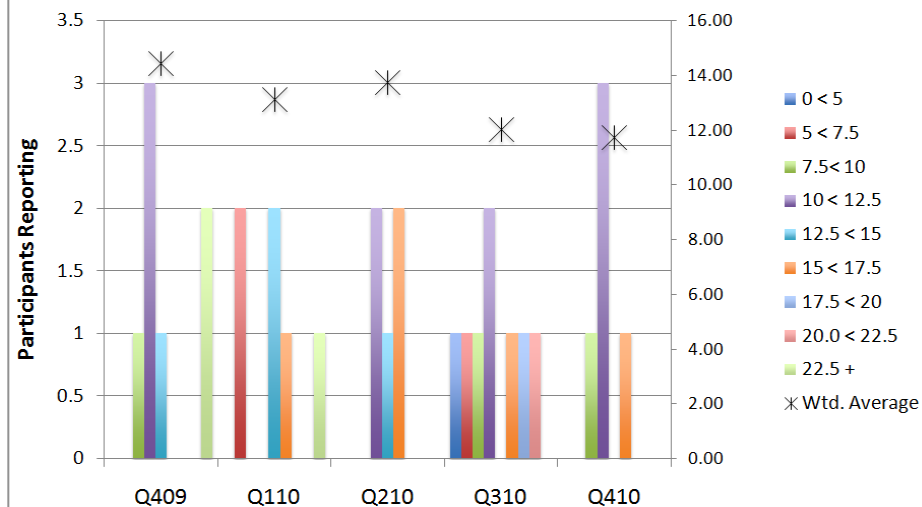
Levelized Costs of Energy (cents/kWh): PV < 1MW

Cumulative Responses from Q4 '09 thru Q4 '10



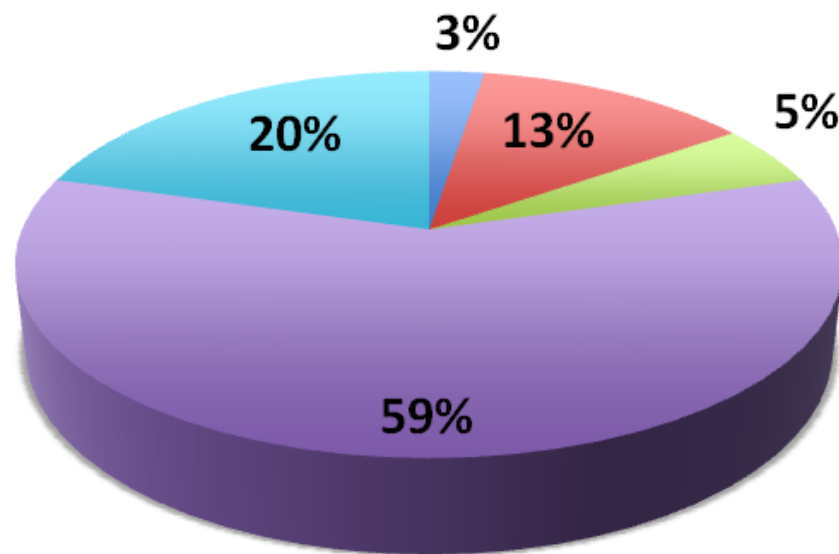
Levelized Costs of Energy (cents/kWh): PV >= 1MW

Cumulative Responses from Q4 '09 thru Q4 '10



REFTI Questionnaire: Bonus Q1 (Q15)

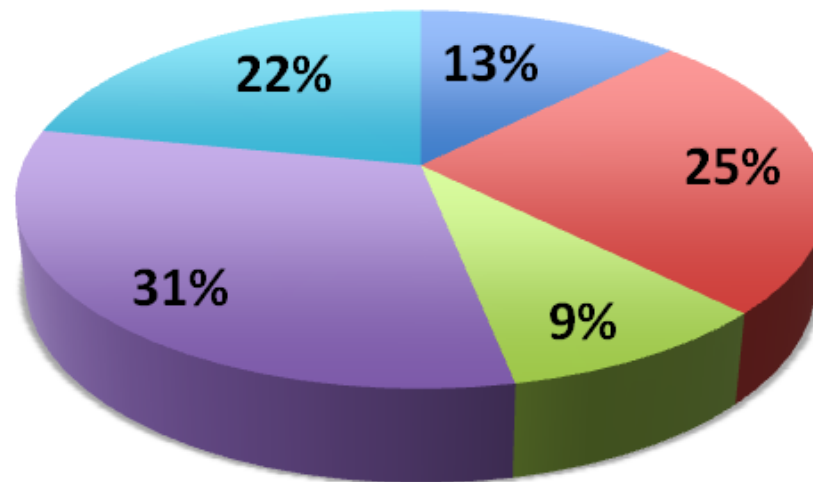
What is your experience with Master Finance Facilities (MFFs)?



- I develop projects through a MFF (if so, pls comment on form and usefulness)
- Tried, but not successfully (lack of project experience or projects are too small)
- Tried, but not successfully (my technology is considered too risky)
- Never heard of them
- I'm not a developer / NA

REFTI Questionnaire: Bonus Q2 (Q16)

Could Methods to Aggregate projects such as MFFs have a significant impact on your ability to raise capital?



- Yes, MFFs are a significant breakthrough
- Yes, but MFFs are not the answer. We need a method to securitize projects similar to the mortgage market.
- No, my projects are too unique to be aggregated
- No, I don't need assistance raising capital (and/or don't want to subsidize another developer with less experience)
- Other

Thank you!

We appreciate your participation!

REFTI results and presentations available
at:

<http://financere.nrel.gov/finance/REFTI>

REFTI H1 2011 coming out soon

Michael Mendelsohn

michael.mendelsohn@nrel.gov

303/384-7363

